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Figure 1. Beach landing craft in Denmark. This type of craft and landing facilities were studied recently by FAO Fisheries Division. It would appear that several of the methods used here might be applicable in other places where no harbors are available.

THE ROLE OF EXTENSION SERVICES IN INLAND FISHERIES

I. Fish Culture

(*a*) General Remarks

The inland fisheries of a country represent a complex wherein the fresh and brackish water resources, and the human element, are the principal agents. Unco-ordinated interaction of these factors leads to some production, but it is unlikely that it will be the highest possible. Fisheries biologists and limnologists have developed a number of methods and techniques by which effective use can be made of the production capacity of inland waters. The application of this young science outside Europe and America is still in its initial stages and it will be a long time before culture of tropical fish reaches the European level. The principles of fish culture, however, are the same for countries with a tropical or a moderate climate, and, in applying these principles, a well-founded extension of fish culture is possible in all parts of the world.

Fish culture is based on relatively simple conceptions. In the course of a year a body of water produces a certain amount of fish food — bacteria, blue-green and green algae, diatoms and other types of microfauna — which are the basic source of production. All the well-known laws on agricultural production, including Liebig's " Law of the Minimum, " are applicable to the production of fish food. The vegetable plankton and the larger plants, produced in a water, can be converted directly or indirectly into fish flesh ; directly, if they are consumed by fish which exclusively feed on aquatic plants ; indirectly, if the plants are consumed by herbivorous fish, which in turn serve as food for carnivorous species. The highest production per unit of surface can be attained by stocking a water with vegetable feeding fish, along with omnivorous species. The choice of species, therefore, depends on the quantity and the quality of the available food. Consequently, for the proper management of free inland waters, stocks of fish are required which are able to make full use of the natural food resources. In impounded waters, on the other hand, the production of fish food can be increased by means of fertilization whilst artificial feeding and other cultural practices can be used to attain a further increase of the output.

On these principles, an efficient industry has been built up in Europe, North America and some East Asian countries. Projects to introduce fish culture into many other countries are well under way now. Since rice growing areas offer excellent opportunities for the culture of fish, the possibilities of combining rice and fish production should be taken into consideration.

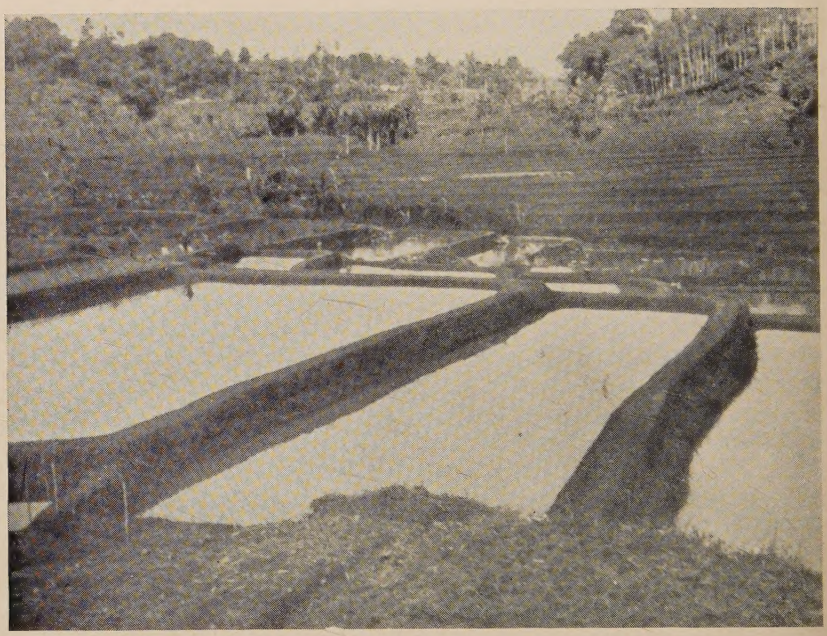

Figure 2. Rice fields in Indonesia ready for stocking with fish.

(*b*) Fish Culture in Rice Fields

Fish culture in rice fields is at present practised in India, Indonesia, Italy, Japan, Madagascar, Malaya and Viet-Nam. It is an indigenous industry in Indonesia, Japan and Viet-Nam, where, in some parts, up to 80% of the rice fields are stocked with common carp and other species of fish. In Indonesia, about 67,000 ha. (165,500 acres) of rice fields are producing fish and in Japan the area used for this purpose at present covers 18,000 ha. (44,500 acres). No reliable information is available from other countries. Most of the available publications are brief descriptions of methods applied or reports on basic experiments; research work on the influence of fish culture on the rice crop was done only in Japan and Indonesia.

The principles of fish culture in paddy fields are very simple. Enclosed on all sides by bunds, with a water layer of 10 to 50 cm. (4 to 20 in.) above a flat bed and with a regular inflow of water, an irrigated rice field very much resembles a fish pond. Fish food — blue-green and green algae, diatoms, worms and snails — grows abundantly in the shallow water. The time the field is kept flooded is sufficient to yield from 50 to 150 kg. of fish per ha. (45 to 135 lb. per acre). Farmers inexperienced in fish culture often fear that the fish may damage the crop. They have to be convinced that no harm is done, but that, on the contrary, rearing fish contributes to increased rice production.

Common carp and other cultivatable carp-like fishes do not propagate in a natural way in rice fields; therefore, if carp culture is applied, it is necessary to stock the fields at regular intervals with fry or fingerlings. However, in areas abundant in water, hardy types of air-breathing fish can be used to furnish a perennial stock of fish. A few hundred full-grown specimens are sufficient then to restock an area after a period of drought. In this way a large production is obtained from swampy rice areas in Malaya, Indonesia, Thailand, India and Viet-Nam.

The biological and physical factors controlling the rice and fish production are closely related. The paddy production depends on the fertility of the soil, on the quality of irrigation water, on the way in which tilling, manuring and seed selection is done, and on the control of pests and diseases. The same factors also cover the production of fish. Agricultural science and agricultural technology, limnology and fisheries biology are, in fish culture, reciprocating parts of the enterprise, and it is obvious that under these circumstances co-ordinated measures for the culture of rice and fish have to be taken.

Fish production in rice fields can be classified as follows :

(1) *Catch of Wild Crop*

Every irrigated rice field produces a certain number of " wild or extraneous " fish which come into the field with the irrrigation water. Some of these fish endure the dry periods buried in the mud, and in swampy areas the rice fields become naturally stocked. The fish are caught by placing nets or traps in the outlets or by digging wells in which they gather when the field dries. In Indonesia, the paddy fields produce an average of 3 kg. per ha. of these extraneous fish in a period of six months.

(2) *Culture of Air-breathing Fish in Swampy Rice Fields*

Areas of rice fields having a natural water level of more than 20 cm. (8 in.) for a 6 to 10 month period, can be stocked with certain types of fish as a unit. Very good results can be obtained by stocking *Trichogaster pectoralis* (Sepat siam), an air-breathing fish, able to endure high temperature and the low oxygen content of water in swampy rice fields. In the beginning, only perennial waters of an area are stocked, whence the fish spread, spawning in the rice fields during the wet seasons. Before the paddy is harvested, the fish are caught in wells, dug in the lowest parts of the paddy fields. During the dry season, some fish are retained in the wells whence they spread over the fields after irrigation. Production depends on the fertility of the rice fields ; *Trichogaster* is a plankton feeder and the production of plankton mainly depends on the fertility of soil and water. Crops may vary from 20-30 kg. of fish per ha. (18-20 lb. per acre) in 6 to 10 months time.

In the same way as *Trichogaster*, other air-breathing fishes may be cultivated in rice fields. Well-known are Murral, or snake head

(*Ophiocephalus*), and Catfish (*Clarias*). Since they are predacious fish, they yield less than *Trichogaster*. A list of fishes which, according to available information, are grown on rice fields may be found at the end of this article.

(3) *Fish Culture in Rice Fields*

In applying this system, a rice field is stocked with sufficient fish for 40 to 60 days while the rice is growing. A water level of 15 to 30 cm. (6 to 12 in.) is maintained during the period and the fish swim among the growing rice plants. The fields are sometimes used as hatcheries, fry being reared to fingerlings, but more often they are stocked with fingerlings in order to obtain pan-fish, 50 to 100 g. in weight. Stocking fingerlings makes it possible to produce from 30 to 50 kg. of fish per ha. (27 to 45 lb. per acre) in 40 to 60 days time. Since a field may be used for the cultivation of fish from about the fifth day after the paddy has been planted, higher yields are possible in accordance with local circumstances. Experiments in Indonesia have shown that an increase of 7% in paddy production is attained if fish are grown on the fields.

Up to a few years ago common carp (*Cyprimus carpio*) and goldfish (*Carassius auratus*) were used mainly for culture in planted rice fields. At present, *Tilapia* is also widely used for this purpose.

(4) *Fish Culture as a Secondary Crop*

Fish may be grown on the paddy fields as a second crop where sufficient water is available for at least three months after the rice harvest. By strengthening the bunds and digging trenches, the paddy field can easily be transformed into a pond. The field is then stocked with fingerlings at a rate of 750 to 1,500 fish per ha. (300 to 600 per acre), using either common carp or *Tilapia*. Production depends on the quality of soil and water, and the duration of the rearing period. Calculated per hectare per annum, the yield might be as high as 300 kg. (660 lb.).

In areas with perennial irrigation three yields of rice are sometimes reaped in two year periods. Applying the methods described above, it is possible to use the fields for fish culture for a certain period between the harvests.

(*c*) Fish Culture in Natural Waters

An analysis of the techniques described above makes it clear that the operations involved are mainly extended for the rearing and not for the breeding of fish, implying that young fish have to come from other sources. Hatcheries are necessary to produce fry or the fry have to be caught in rivers. For the propagation of carp, Sepat siam and *Tilapia*, special spawning techniques have to be applied; fry are reared in special ponds and mature fish stored in tanks. This

is why extension work in a rice area cannot reasonably be restricted to a single activity. Concurrently with fish culture in paddy fields, hatcheries must be established and fish culturists trained. The implementation of a complete fish culture scheme has so many advantages that one should always endeavor to produce as much fish as is necessary to stock natural waters of an area concurrently with putting into effect a pond culture scheme.

There is no doubt that irrigation reservoirs, lakes, swamps, tanks and canals can also be used for fish culture purposes, but without planned management the fish production of these waters will be low. Their primary food resources consist of aquatic micro-fauna and flora, higher organized water plants and refuse matter from the shore. The aim should be to utilize the primary food directly by converting it into fish suitable for human consumption. With a range of cultivatable fish available it is possible to provide for the proper stocking of the various types of water which occur in a particular area.

Officers of the Indonesian Extension Service, for instance, stocked a swampy lake in the southern part of Celebes in 1937 with a few hundred *Trichogaster pectoralis* and *Puntius javanicus*. Consequently, the export of dried salted fish from the area, which was nil in 1935, rose to 10.5 million kg. (23 million lb.) in 1948, and the consumption of fish in the area rose to more than 4 million kg. (8.8 million lb.) of fresh fish a year. It is unquestionably true that improvements of this magnitude may not be regarded as being within reach everywhere, but it is necessary to emphasize events like these in order to get the complete picture.

While it is impossible within the limits of this paper to discuss in detail the various measures for the development of inland waters, it appears essential to include some reference to pond culture.

(*d*) Pond Fish Culture

The object of pond fish culture is either to rear pan-fish for consumption or to rear fry, fingerlings or yearlings for stocking or release in public waters.

Ponds of various construction are required for the proper operation of a pond farm, so spawning, rearing and holding of fish call for special types of water. In Europe, the scientific principles of pond culture have been studied for almost a hundred years and the result was that in Germany and some other central European countries, pond culture developed into an important branch of the national economy. Culture of warm water fishes, on the other hand, is still in the first stage of development. The basic knowledge, established in Europe, is doubtlessly applicable to all types of pond culture, although perfecting the cultural operations is still a matter of study in many tropical countries.

The natural productivity of ponds varies from 25 to 400 kg. per ha. (20 to 360 lb. per acre) a year in Europe and amounts to about 350 kg. per ha. (310 lb. per acre) per annum in the central part of

North America. In warm climates a considerably higher productivity may be accounted for by the fact that the rate of growth doubles with every 10°C rise in temperature between certain limits. In tropical countries the natural production of ponds is within the range of 500 to 2,000 kg. per ha. (445 to 1,780 lb. per acre) per annum. Annual yields of more than 9,000 kg. of fish per ha. (8,000 lb. per acre) have been achieved on experimental stations.

The production of natural food in a pond can be greatly increased by the use of fertilizers ; green-manure, stable-manure and artificial fertilizers are equally suitable. Artificial foodstuffs may be given to the fish in addition to the food provided for them by nature, thus allowing a greater density of stock and attaining a better utilization of the natural food. Twenty kg. (44 lb.) of potatoes, for instance, when fed to carp will give an additional production of 1 kg. (2.2 lb.) of fish ; 1.5 kg. (3.3 lb.) of rice bran will give an additional kilogram of milkfish. In tropical countries mainly kitchen waste, rice bran, and green vegetable matter are used as artificial foodstuffs.

Classical European pond culture is based on the rearing of carp and trout, whilst in North America during the last decades the culture of black basses and sunfish (*Centrarchidae*) has made great progress. In Africa various types of perch-like fishes (*Cichlidae*) are reared and in some parts of Asia a century-old system of rearing marine fish is applied. The pond areas in the Far East have reached an extent of hundreds of thousands of hectares. Carp-like, air-breathing, perch-like and herring-like species are reared in fresh-water and brachish-water ponds on a successful commercial basis. In Indonesia, there are about 120,000 ha. (296,400 acres) of ponds ; in the Philippines the pond area is about 73,000 ha. (180,300 acres) ; and in Israel, the carp production of the pond fishery increased from 2,900 tons in 1949 to 4,013 tons in 1950 from a pond area of 2,700 ha.

There are clear indications that undeveloped potentialities for inland fisheries still exist in many countries. The main reason for this neglect of resources is that the existence of the production potential has not been brought to the attention of the competent authorities. It is unreasonable to expect an administrator to give serious thought to an object of such a special nature when his attention is not focussed on the subject by professionals. But, on the other hand, all over the world there are not more than ten or fifteen people who can give expert advice on the pond culture of exotic fishes. These experts are at present still exploring an almost unknown field of production, but they can use fairly compact knowledge concerning methods and techniques gained in Europe. Research is not the most difficult part of their work. In Europe or North America it would be sufficient to publish the results of work in a professional paper to attain practical application. In lesser developed countries limnologists have to find ways in which knowledge can be transmitted to persons outside the laboratories and experimental stations.

To date little experience has been gained in extension work in inland fisheries. In tropical areas, fisheries extension is a very young

science which deals with many unsolved problems. The second part of this article discusses the general principles and the most important problems involved in extension work in inland fisheries.

II. Extension Services

(a) General Remarks on Fisheries Extension

Extension services have evolved in most countries with highly developed fishing industries. Although experience in fisheries extension work in highly developed countries may not be directly applicable to countries in Asia or Africa, the organizational experience of these countries can be used in planning and establishing new extension services. At present, only a few countries outside Europe and the United States have special extension services for inland fisheries, and very little has been published about their activities. At this juncture it is therefore only possible to discuss things in general and to draw attention to some special aspects of extension work.

In establishing an extension service, the first problem is to determine the level on which the new service should be fitted into the existing governmental administration. Should inland fisheries be combined with sea fisheries in a Fisheries Department, or should it be made a part of the Agriculture Department ? This question is often put forward and can only be answered by considering the principles and objectives of the basic activities.

Although fish comes both from the sea and inland waters, the methods of production differ considerably. Knowledge of the methods of capture is the ruling factor in the primary phase of marine fisheries, and transportation and processing are important in the secondary phase. Marine fish are cropped naturally and no cultural operations are applied to increase production. On the other hand, comprehensive operations are necessary for the cultivation of fish in impounded bodies of water. The production of inland waters depends on the fertility of soil and water and on the cultural operations applied. Fish culture and agriculture are based on the same principles and the field of production, the land, is the same for both industries, even when the land is flooded to attain production. Fish from inland waters are a product of the soil as well as of the water, and knowledge of the principles of selection, fertilization and tillage are as important for fish culturists as they are for agriculturists. Since it is therefore reasonable to regard inland fisheries as an agrarian enterprise, fisheries biologists with a fair knowledge of agricultural problems are required for the staff of an inland fisheries extension service.

In trying to determine the factors having a definite influence on the character of an extension service, the following facts should be considered :

(1) No lasting results can be obtained by improving a single factor of an agrarian enterprise. If the economic structure of the

enterprise is weak, fish culture or horticulture will contribute very little towards obtaining equilibrium. In the establishment of an extension service, therefore, knowledge of the economic structure of the agrarian system, of the factors hampering development and of the potentialities for development are points of primary importance.

(2) On a farm, purely agricultural problems may arise, but horticultural, veterinary or fish cultural matters must also be dealt with, since a farmer uses production methods which might involve all these. An extension service, therefore, should have specialists of the various types of production on its staff or, better still, the service should be divided into branches, specially concerned with the related type of production.

(3) In general advisory work, more than one extension branch is involved. Thus, it should be realized that various branches of an extension service, operating in the same area, should be efficiently co-ordinated or should carry out their work with full understanding and knowledge of each others' aims to prevent controversy.

(4) The inland fisheries branch of an extension service should cover the cultivation of fish in ponds and rice fields and the stocking and management of inland waters. Sub-division into fresh-water and brackish-water sections is necessary. It is advisable to determine the size of the branch as soon as possible ; in so doing, consideration should be given to the potentialities of economic development of specific types of production. Practical experience is an indispensable requirement for extension work and its absence may retard development.

A decision should also be reached on the system to be applied in training farmers in new techniques. In most of the areas, the limits of agricultural improvement — low level of education, shortage of trained personnel, lack of financial support and insufficient relationship between research and advisory services — also apply to fish culture. This may be one more reason for embodying fish culture in the advisory system accepted for agricultural extension, but there is still doubt as to the methods of training.

In western countries use can be made of journals, pamphlets, radio courses, shows, clubs and the like in agricultural and piscicultural extension work. The educational level of the farmer makes this possible and he responds favorably, especially when he realizes that the use of improved methods increases his financial return.

The situation in the under-developed countries is very different. Here the farmer can rarely read or write and hence the written word is only of limited use. Similarly, he does not possess a radio, his income being far too small for this. Thus, many of the educational aids used by extension workers elsewhere cannot be used effectively in such countries as Asia, Africa and other places where under-development and under-privileges are endemic.

Extension work in such areas offers special problems and requires special training for teachers and leaders. Extension teaching must be adjusted so that only practicable methods and systems of educa-

tional aids are used. Such adjustment can only come from a careful survey and penetrating understanding of the nature of the problem.

For countries with a more or less illiterate rural population, special methods of advising the people on agricultural and fish cultural matters have been developed. Conditions will change when the education level rises, but at present, it is difficult to convince a rice farmer by the spoken or printed word.

FAO has tried to collect information on extension work in inland fisheries in tropical countries and the results have not been very impressive. It seems that Indonesia is the only country possessing a fisheries extension service that has functioned long enough to make conclusions possible. In this connection reference is made to the conclusions in a paper, contributed by the former head of this service, A. E. Hofstede, to the first fish culture seminar in Djakarta.

(*b*) Fisheries Extension in Indonesia

In Indonesia, in 1860, European agriculturists were already investigating the fresh water and brackish-water fish ponds and published papers on the fishing industry. An Agricultural Extension Service was established in 1910 and an Inland Fisheries Extension Service followed in 1920. Of course, these Services have undergone changes during the years of their existence, but there has never been any meddling with the principle : " inland fisheries belong to agriculture. " At present, the Service has two separate sections : the Extension Service, in the strict sense, and the Laboratory for Inland Fisheries, engaged in research in support of extension work. Before proceeding to the discussion of the demonstration system applied, a few words must be said about the personnel.

The basic figure in Indonesian extension work is the *mantri* or *Local Officer*, who is very often the son of a farmer and has not more than an elementary school education. Coming into the fisheries service, the twenty year old youths get two years of practical training in fisheries work under the guidance of an experienced local officer ; during this training they may be sent to attend courses held by the Service or they may be ordered to take part in hatchery work or in special activities outside the area. A mantri is always trained for work in his native area as knowledge of language and local customs is regarded as a very important factor for his future work. When put in charge of his own district, a mantri never supervises more than eight villages (or 25,000 people) as it is felt desirable that he should be able to establish personal contact with most of the farmers in his district. A mantri knows the techniques and principles which the service wants to introduce in the areas involved and he is not expected to deal with other problems. The simplicity of his work, which he fully masters, makes it possible for him to achieve authority over his co-villagers, who also regard him as one of themselves.

The next higher rank in the Indonesian Service is that of *Secondary Officer* or *Supervisor of Fisheries*. The men holding this rank have

had two years of training at an agricultural school where they specialized in fisheries. In the Service they receive a year's practice as an assistant to a senior officer before being put in charge of a fisheries sub-district ; they also may be charged with the supervision of field experiments or become superintendents of hatcheries.

A fisheries district in Indonesia, covering three to five sub-districts, is headed by a *Primary Officer*, who has had three to four years of education at an agricultural college where he has specialized in fisheries. A Primary Officer is responsible for the proper management of the inland water resources of his district ; the waters are stocked, fished and operated in accordance with a scheme, designed by him in co-operation with his Head Office, the Central Inland Fisheries Office and the Laboratory. The various fisheries districts of an autonomous administrative territory (province) are under the direction of a Head Office of which a *Graduate Officer* or a *Senior Primary Officer* is the chief. Graduate Officers have academic training in agriculture or biology followed by at least two years practice in an experimental station or in field service. The administrative and planning center of the service is the Central Inland Fisheries Office at the Ministry of Agriculture, which is also responsible for the correlation of the work with other divisions and ministries.

As inland fisheries are a sub-division of the Ministry of Agriculture, inter-departmental co-operation is fully granted and in practice the extension services for agriculture and inland fisheries actually work hand in hand. The close relationship between both Services is also shown by the fact that the Laboratory for Inland Fisheries is a branch of the General Agricultural Experimental Station, which arrangement makes it possible to use the specialized institutes of the station (soil-science, agricultural technology, pests and diseases) for the benefit of both Services.

(*c*) Methods of Fisheries Extension

Technically competent personnel are, of course, very important for an extension service, but even adequate personnel will fail when they are not trained in efficient methods of vocational training. Many years of experience have led to the recognition of the fact that practical demonstration of new techniques is the best way of training farmers and fishermen. Simultaneously, agricultural and inland fisheries services have come to the point where model farms and demonstration ponds have become an important means for improving the status of rural populations. The aim in establishing demonstration ponds and farms is more than just to show how fish are grown ; the pond farms should become places where farmers and officers of the governmental agencies meet ; they should even become education centers. The pond farm should be a place where a local officer, well-known to the people, receives them as guests and shows them with pride the results which can be achieved by applying new methods. At the farm, people should also be provided with the materials they need for adopting a

new technique. It is economically impossible to equip an extension service with as many scientists as are needed to instruct all the farmers. Only if the last step in advisory work — the committing of knowledge to the farmer — is taken over by well-trained local officers, can an extension service cover a wide area with reasonable costs. No one can blame a fisherman or a farmer for accepting advice only from a man whom he feels confident knows the work. He wants visible proofs before accepting a new technique.

Let, therefore, a local officer demonstrate on the spot what can be done by growing rice and fish in accordance with modern methods and let the people see the results with their own eyes. Let the people educate themselves and let the planners stay in the background. This is the way extension work has been done in Indonesia, a rice-growing country, and there is no doubt as to its effectiveness. Acceptance of this principle may save a country from many errors and failures.

Development in fisheries cannot come overnight. No foreign expert can build up a fishing industry in a few months, and schemes and plans of experts will only end in a file when the country does not find the strength to provide for officers able to carry through the work. To mobilize the rural population, the sons of the land, the simple men in the villages, must become the bearers of progress and, by training a group of them for work in an extension service, a professional man can attain more in a year's time than he could in many years of disseminating his knowledge directly to the farmers. In spite of progress in populated areas, the rural areas of a country remain under-developed when a wide application of modern techniques is not achieved ; this implies that work in universities and laboratories does not become useful to people of the country when the establishment of advisory systems does not keep pace with research.

Inland fisheries is the younger sister of agriculture but only a very restricted number of people have made tropical limnology and culture of warm water fishes their field of study. When even in well-developed countries the extension services are inadequate to bring existing knowledge of agriculture and fisheries rapidly into practical use, a number of problems still have to be solved before real progress is attained.

It is impossible to design a common over-all plan for the development of inland fisheries in tropical countries, but the following points may be regarded as a summary of available information and practical experience :

(1) It stands to reason that research work should be the first step in developing fresh and brackish-water resources of a country. Proper management of inland waters is impracticable without an investigation of the basic factors of production. A complete survey would include the determination of the quantity and quality of fish food organisms in the different types of water, the study of feeding, breeding and growth of cultivatable species, the study of fish associations and the study of the optimum densities for stocking various types of inland waters. In the initial stages, only the first two items mentioned may

be taken in hand but the remaining ones should also get their appropriate place in the working scheme. Due consideration should also be given to the fish seed resources of inland waters and their transport and distribution. A team, consisting of a limnologist and a fisheries biologist is, under normal conditions, able to obtain in one year reasonable knowledge of the ecological conditions of a country's inland waters. Where a country has no scientists with appropriate training, the United Nations' Expanded Technical Assistance Program (ETAP) offers an opportunity of getting experts for the period required. The experts in their turn may train local officers in limnological and fish culture work.

(2) Fish culture in ponds is the first practical action in developing inland fisheries. In a number of pond farms in the various parts of the country, autochtonous fishes should be tested on their merits and, where suitable species are lacking, exotic fish should be introduced. The fish farms should be constructed by local workers in accordance with instructions available in literature or according to the advice of appropriate agencies. Persons with reasonable training in agriculture and fisheries should be made superintendents of the farms. Fish culturists should be selected from local workers and be instructed by the scientists mentioned above. No fish culturists should be allowed to introduce new species of fish into a country without being first advised by trained ichthyologists.

On pond farms, plankton-feeding, plant-feeding and omnivorous fishes should be reared to make effective stocking of all types of water possible. After scientific investigations have shown the type of food present and the degree to which it is used by the indigenous fish populations, the farms should be ready to supply the amount of fish required for stocking operations.

(3) Pond farms should, as soon as possible, be extended to educational centers where the higher ranking officers are trained in limnological work, the lower ranking officers get their fish cultural training, and the local people can acquaint themselves with the aspects of fish culture. Experts should use the pond farms as centers of instruction and should make them a basis for their survey work.

(4) A number of farmers should be selected to grow fish on their own estates in the neighborhood of the pond farms under the supervision of the personnel of the fisheries service. In the initial stage a promise should be given that financial losses should be covered by the service but, on the other hand, the farmers should undertake to follow correctly the instructions of the fisheries officers. For the first experiments, fry and implements will have to be supplied by the service.

(5) Concurrently with limnological investigations and the establishment of pond farms, a beginning should be made to forward the building-up of an extension service. Local officers should be trained on the pond farms in fish culture techniques and later should be put in charge of small districts. The higher ranking officers charged with the supervision of the local officers should be selected from the staff

of the pond farms and, in this way, proceeding step by step, the service should be provided with personnel knowing practical work equally well or even better than the farmers and fishermen.

Nowhere has the development of inland fisheries been attained by investigation only. Research without extension means wasting time and money. The basic principle in fisheries extension is an advisory service, locally built up under the guidance of people who know both the theory and practice of inland fisheries.

Recognition of the need for adequate extension immediately leads to the question whether local or foreign personnel should organize the service. A foreign expert can do good work in basic research but lack of knowledge of ethnological and social conditions are a handicap for him. If there is any service in a country in which local labor should be the leading element, it is surely an extension service. People with training in agriculture or biology are available almost everywhere. Practice in inland fisheries, on the other hand, is something that cannot be attained in a hurry, although, in the beginning, even the practical knowledge of the basic operations in fish culture will give the extension officers authority with the farmers. FAO, recognizing the fact that there is a gap between educational and practical training in many countries, has organized, and will continue to organize, regional courses or seminars for officers who want to equip themselves with the necessary practical knowledge. ETAP also provides for fellowships for more extended study of fish culture in countries where this industry has reached a certain level of development.

Experience in fisheries extension work in under-developed countries has strikingly illustrated the fact that the tempo of development is mainly dependent on the degree to which properly trained intellectual workers in the country are ready to take part in the practical vocational education of the rural population. Even when it is assumed that the tempo of development can be considerably speeded up by temporarily using foreign experts, the country itself has to make the biggest contributions to the effort. Efficient extension services can only be set up when the animosity, which often exists towards work outside the laboratories and schools, can be overcome, and when the intellectuals agree to work side by side with the farmer in the field.

Practical demonstration of new methods by local officers living in close contact with the farmers is the key to extension work in underdeveloped countries. However, whichever course is adopted in solving the problem of how to feed the growing population, the principles of agricultural production and economy will have to be applied to fish culture if a lasting increase of the production of inland waters is to be achieved.

W. H. Schuster

SPECIES OF FISH, CULTIVATED IN RICE FIELDS

Species	Feeding Habits	Country
Cyprinus carpio	Omnivorous	China, Japan, Indonesia, Viet-Nam Madagascar, Italy.
Carassius auratus	Omnivorous, partly predacious	China, Japan, Madagascar.
Tilapia mossambica	Mainly vegetable	Indonesia.
Trichogaster pectoralis	Plankton	Malaya, Thailand, Indonesia.
Ophiocephalus striatus	Carnivorous	Malaya, Indonesia.
Calrias batrachus	Carnivorous	Malaya.
Anabas testudineus	Omnivorous, mainly insectivorous	Malaya, Indonesia.
Catla catla	Vegetable and plankton	India (experimental)
Labeo rohita	Phytoplankton and vegetable	India (experimental)
Cirrhina mrigala	Phytoplankton	India (experimental)

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FAO TECHNICAL ASSISTANCE PROJECTS IN FISHERIES DEVELOPMENT *

The provision of technical assistance is not new to the Food and Agriculture Organization. In fact, a program of technical assistance to member countries was contemplated at the very time the Fisheries and other divisions of the Organization were being planned and formed in 1943-46. Therefore, a large part of the work of the Fisheries Division has always been concerned with supplying aid to governments in fisheries statistics, economics, biology and technology. With the advent of FAO's Expanded Technical Assistance Program (ETAP) the Division is now in a position to render greater assistance along these lines. The ultimate aim of this work is to produce more fish and assist in getting this crop to market in a more orderly manner.

Statisticians inform us that the annual world production of fish is about 25 million tons. Nutritionists tell us that the population of the world could easily consume 50 million tons annually. Biologists say that the fisheries resources of the world are of sufficient magnitude to yield a production of this amount. However, to attain this goal it would be necessary to invest stupendous sums in boats, facilities, equipment, labor and research and it would be many years, if ever, before a production of this size was realized. Meanwhile, however, the fishing industry must go forward and do its best to produce more food with the means at its disposal, and it is our hope that the Fisheries Division's share of ETAP can in some measure help in this direction.

In connection with fisheries development it is interesting to note that many of the latent fisheries resources of the world seem to lie in waters off the coasts of under-developed countries or in their inland waters — for instance, in the waters off the coasts of Africa and South America and in the inland waters of the Indonesian archipelago. FAO is attempting to increase fish production in some of these areas, as well as in others where fishing effort can be intensified. Technical assistance is also being rendered in many other fields of the fisheries industry requiring experts qualified in many skills and professions. From time to time ETAP staff has included biologists, economists, technologists, civil engineers, fish culturists, fisheries engineers, fish-promotion specialists and fisheries administrators. These experts have been recruited from Argentina, Brazil, Chile, China, Denmark, England, Greece, Iceland, Indonesia, the Netherlands, Norway, Peru, Portugal, Spain and the United States.

A brief account of the projects under way or in negotiation is given in the following sections.

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* Editor's Note. *This is a revision, as of April, 1952, of an article prepared by the writer in February, 1952, for the 1952 issue of the Fisheries Yearbook of the National Fisheries Institute, Washington, D.C., U.S.A.*

Assessment and Management of Fisheries Resources

Assistance in this field is being rendered to *Chile* in a program of development and management of its extensive hake fishery. This project is under the direction of Dr. Erik M. Poulsen, of Denmark, who has been loaned by his government from his position as Chief of the Salt Water Section of the Danish Biological Station.

An assessment of the marine fisheries resources of *Ecuador* is being made under the direction of Dr. E. C. Schweigger, of Peru. This project will involve the preparation of a program for its development, conservation and management. Dr. Schweigger is on loan from the Peruvian Guano Company where he served for many years as biologist and oceanographer.

The possibilities of further development of the sponge fisheries in waters off *Libya* have been studied and reported upon by an FAO expert, C. D. Serbetis, of Greece. Mr. Serbetis was on loan from the National Fisheries Bureau of Greece. Attention was also given to the possibilities of expanding fin fisheries in these waters.

Israel, under agreement, will be provided with a fisheries scientist to assist in reviewing the present fisheries biological research program and in implementing a revised and extended program aimed at development and management of the marine and fresh-water fisheries resources.

Under an agreement with the Government of *Turkey* a biologist will be provided to assist in developing and implementing the fisheries biological research program of the country. In accordance with a pending agreement, *Ceylon* will be supplied with a biologist to make an analysis of the catches of government operated trawlers to appraise fish stocks on several fishing banks off the island and an algologist to survey the seaweed resources and possibilities for development of a seaweed extraction enterprise.

A draft agreement is in preparation to provide *Cuba* with one fisheries biologist to appraise fisheries resources and formulate a program for fisheries research and exploration.

Exploratory Fishing

Surveys to locate, explore and chart fisheries resources will become of increasing importance. Agreements have been signed with the governments of *Turkey*, *Saudi Arabia*, *Iraq* and *Italian Somaliland* for the conduct of such surveys in the marine waters of their coasts. Concurrently, study will be made of the efficiency of various types of fishing gear and craft.

The project in Italian Somaliland is in progress off the north coast with the assistance of H. Ogilvie, of the United States, as fisheries engineer, and A. Fraser-Brunner, of England, as biologist. Mr. Ogilvie is a trained Californian fisherman and at one time served as first captain in Honolulu for the Pacific Oceanic Fishery Investigations of the

United States Fish and Wildlife Service. Mr. Fraser-Brunner is specialized in fish taxonomy and previously studied fish populations in waters of the Gulf of Aden. The experts are conducting their work aboard a commercial fisheries vessel through the co-operation of an Italian fishing company.

The project in Saudi Arabia will get under way in the Red Sea in October 1952 with the assistance of Dr. Mohammed K. el Saby, of Egypt, and Luigi Farina, of Italy. Dr. el Saby, a biologist, is at present the Director of Fisheries of the Egyptian Government and will be loaned to FAO for this assignment. Mr. Farina is a practical, commercial fisherman operating his own fishing vessel off western Italy in the vicinity of Anzio. He has conducted researches to improve fishing gear and published reports on this work. The Government of Saudi Arabia will charter a commercial fishing vessel out of Suez to carry on this project.

It is expected that the projects in Turkey and Iraq will get under way during the early summer of 1952.

An agreement is being negotiated with the Government of *Syria*, to provide for a fishery exploratory survey in the Mediterranean Sea off the coast of this country.

Creation of New Fisheries Resources

A number of projects are operating to create new fish resources through the introduction of Far Eastern techniques for raising fish in ponds. One such project has been in progress in *Haiti* since November 1950 under the direction of S. Y. Lin, a fish culturist from China. Nursery and rearing ponds have been constructed and these have been stocked with carp from Alabama, furnished through the co-operation of the United States Fish and Wildlife Service, and a fast-growing tropical fish called *Tilapia* from Jamaica, supplied through the government fisheries service for that island. Such favorable results have been obtained that private interests are taking steps to apply the techniques introduced to raise fish in private ponds. To assist in this direction the Government of Haiti will be provided with a fish nurseryman by FAO in 1952.

In *Thailand* a somewhat similar project is being carried out in co-operation with the Mutual Security Agency, formerly the European Co-operation Administration (ECA). This is under the direction of S. W. Ling of China. Here the problem is to assist in extending pond culture practices to inland areas for the purpose of supplying fish to people of the hinterland where animal protein is scarce and expensive. This involves the strengthening of an extension service within the fisheries agency of the Thai Government to instruct inland fish farmers in pond culture techniques and methods. Other phases of the project are concerned with marsh utilization for fish culture and the development of a program to manage other natural inland

Figure 3. Haiti : Triangular and rectangular running water ponds in Mariani, constructed under the direction of S. Y. Lin and used for experiments on extensive cultivation of fresh water mullet and carp.

Figure 4. Thailand : An old-fashioned wheel pump, to which a motor has been added, has been used to drain this Thai pond from which workers are collecting the fish.

fisheries through co-operatives. There is the belief that these fisheries would be more productive if they were more wisely prosecuted.

During the past decade or two the pond culture of carp in *Israel* has become an important industry from the standpoint of output and employment. In 1950, production from some 6,500 acres (2,630 ha.) of ponds reached 4,000 metric tons. This aided materially in reducing the food shortage in the country where fish is the principal animal protein food. At present only carp farming is practised in these ponds, but the Israeli Government feels now that the ponds are capable of supporting other types of fish. An expert is being furnished to assist in this development.

Assistance will also be given to *Israel* to help increase fish stocks, and therefore production, in Lake Tiberius (Sea of Galilee) and to develop a program for the management of the fisheries of this lake. While the fisheries of the Sea of Galilee have been prosecuted since before biblical times production still averages around 900 tons annually through the work of some 280 fishermen. There is hope that the output of the lake can be increased through the adoption of a management program. A. E. Hofstede, of the Netherlands, has been selected to carry out this project. Mr. Hofstede recently returned to his home country from Indonesia, where for many years he was engaged in inland fishery research and management for the Netherlands Government.

The Government of the State of *West Bengal*, India, will also be assisted in the improvement and development of fisheries in inland and brackish waters to provide much needed food for local populations. This project will involve improvement in fish culture practices, management of commercial inland fisheries, improvement of fishing gear and craft, and training in methods to eradicate or suppress the growth of obnoxious aquatic weeds in commercial fishing areas. F. Botke, of the Netherlands, will conduct the biological phases of the project and W. A. Mackenzie, also of the Netherlands, will assist in mechanizing fishing gear and craft. Both of these experts were employed for many years by the Government of the Netherlands in Indonesia in marine and inland fisheries development programs.

In this connection, an agreement has also been signed with the Government of *Iraq* providing for inland fisheries development. In addition, an agreement is before the Government of *India* providing for assistance in implementing an inland fisheries extension service and an agreement is in preparation providing for the improvement of fisheries in inland waters in *Syria*. Negotiations are also in progress with the Governments of *Cambodia* and *Viet-Nam* for providing assistance to increase inland fisheries production.

Mechanization of Fishing Craft and Gear

Many countries have requested assistance in the mechanization of indigenous fishing craft and gear to increase domestic fish production. One such project is under way in *Ceylon* under the direction of Alan

Glanville of England. Mr. Glanville has had practical fishing experience in Great Britain and the United States. This project has reached the stage where experimental fishing has shown the existence of considerable stocks of fish. A draft agreement is before the Singhalese Government providing for assistance in organizing shore facilities to service mechanized fishing craft and marine engines.

Figure 5. An out-rigged canoe in Ceylon which might be mechanized through the addition of an outboard motor.

Liberia also is being aided in the mechanization of local fishing gear and craft. This project will be co-ordinated with a biological survey of the marine fisheries to be carried out under the Point IV Program of the U.S.A. H. van Pel has been assigned to this project. Formerly Mr. van Pel was engaged in similar work in Indonesia.

A similar mechanization project will soon be carried out to assist the Government of *Israel* to improve techniques in capturing pelagic species of fish in eastern Mediterranean waters. G. Napier, of the United States, will handle this assignment. He has had many years of practical fishing experience.

India, under a draft agreement, will be provided with a team of three additional experts to assist in boat and gear mechanization at major ports in three states and with a naval architect to assist in improving the design of local craft.

West Pakistan will be provided with a naval architect to assist in improving fishing vessel design under a pending agreement. This will involve the testing of model craft in tanks.

Marketing Facilities

Pakistan has been aided in the development of a fish harbor and market in Karachi. A plan with detailed specifications has been prepared and submitted to the Government. When the plan is executed Karachi will have one of the most modern fish harbors and markets in the East. This project was conducted by A. van den Berg and H. van Pel, of the Netherlands and formerly of Indonesia, where they were in the employment of the Netherlands Government in harbor and fisheries activities. Draft agreements for assistance in harbor development in *Ceylon*, *East Pakistan* and *India* are pending.

Fish Distribution

A project is under way in *Chile* to increase the domestic consumption of hake. This is under the direction of J. Fridthjof, of Denmark. Formerly, Mr. Fridthjof assisted in similar projects in his home country as well as in Uruguay. Several pilot propaganda campaigns or projects have been started as a guide for future activities. One such project included " Fish Week " and a fisheries exhibition, including a fish restaurant, in Santiago. The exhibition was attended by some 250,000 persons during the week and some 21,000 people patronized the restaurant. During the week some 77,000 lb. of fish were consumed.

West Pakistan is to be furnished with one commercial fisheries consultant to assist in organizing fish marketing ventures; and under a pending agreement *East Pakistan* will be provided with another such expert. Under agreement with the Government of *Turkey*, an economist will be provided to assist in developing fish marketing organization. Similarly, under a draft agreement, *India* will be provided with a commercial fisheries consultant to assess pilot plant fishery operations of the Government at Bombay and Calcutta. A draft agreement is in preparation to provide one fisheries economist to *Cuba* to assist in developing systems for the more orderly marketing of fisheries products.

Fish Preservation and Processing

A project under way in *Ecuador* is concerned with the improvement of methods for processing and marketing fish, especially to develop an inexpensive and staple product from local species for consumption among inland populations of the country. Dr. Carlos Gonzalez, of Argentina, is in charge. He is on loan from the Argentine Department of Agriculture. A considerable part of his fisheries training was received in the United States through the Latin American student exchange program. A similar project is under way in *Liberia* under

the direction of J. van Pel, of the Netherlands. Mr. van Pel formerly was engaged on this type of work in Indonesia. Under a draft agreement *Yugoslavia* will be supplied with one technologist to assist in improving fish canning techniques. Under a signed agreement, the Government of *Turkey* will be provided with one technologist to assist in operating fish freezing and cold storage plants and another technologist to help in surveying possibilities for producing fish meal from local species, said to be abundant in the Black Sea at certain seasons.

Fisheries Administration

An agreement has been signed with the Government of *Finland* providing for an expert to review the work of the national fisheries administration and fisheries research program. A. C. Taft is being assigned to this project. For many years he served as Chief of the Bureau of Fish Conservation of the State of California, U.S.A. A draft agreement for assistance in this field is before the Government of *Egypt*. This provides for one statistician to assist in preparing and setting up a program for the collection, tabulation and publication of fisheries statistics. A draft agreement is before *Panama* for assistance in an assessment of its fisheries resources and the development of regulations for the conduct of the fisheries industry. A draft agreement is also in preparation providing for assistance to *Syria* in establishing a national fisheries agency.

A draft agreement is before the Government of *Ceylon* providing for assistance in a structural survey of the fisheries industry and the people engaged therein.

A reconnaissance survey was made in *Brazil* to determine the types of technical assistance needed to improve fishing methods to produce fish for domestic consumption. Dr. C. J. Bottemanne of the Netherlands conducted this survey and is preparing his report. For many years he served as Head of the Sea Fisheries Institute in Indonesia where he was responsible for the organization of centers for marketing the fish catches and the development of schemes to improve the social welfare of fishing families. Negotiations are under way for a similar survey in *Ethiopia*.

Fisheries Education

Educational work forms an important part of the fisheries technical assistance program. Under the sponsorship of the Government of *Chile* a Latin American Fisheries Training Center was held at the Santa María Technical University in Valparaiso from 6 January to 15 March 1952. Intensified instruction was given in the fields of fisheries biology, technology, economics and administration. (*See* pp. 82-85).

The Government of *Indonesia* has offered to sponsor a seminar on fish culture at Djakarta in May-June in co-operation with FAO.

This seminar will accommodate some 22 students from the Indo-Pacific area. W. H. Schuster, FAO fish culture expert in Rome, and Dr. K. F. Vaas, will conduct the lecture. China has nominated two students to attend the seminar, India four, Indonesia five, Japan three, Pakistan one, Thailand three, and Viet-Nam one.

Figure 6. Nai Boon Idrambarya, Director of Fisheries in Thailand, addressing students at the preliminary statistical training course held in Bangkok, 16-24 August 1951 (see *FAO Fisheries Bulletin, Vol. 4, No. 5, p. 40*).

The Government of *Thailand* has offered to sponsor a fisheries statistics school in Bangkok for a period of six weeks, during the summer of 1952 in co-operation with FAO. Training will be given in the collection, tabulation, and publication of fisheries statistics through classroom study and practical field work. Students will be drawn from the Indo-Pacific area. Discussions are in progress with the Government of the *Philippines* for the conduct of a school for fisheries technology, and with the Government of *India* to conduct a school for fisheries administrators.

Negotiations are in progress with the Government of the Crown Colony of *Singapore* to hold a Training Center for Master Fishermen in Singapore. There will be three terms, each of three months' duration ; the first is expected to begin in the autumn of 1952. About 45 students from the Indo-Pacific area will be accommodated. Intensified prac-

tical training will be given in mechanized fishing techniques, small boat operation and maintenance, care of the catch aboard the boat, unloading, and handling on the pier. The Special Technical and Economic Mission (STEM) of the United States Mutual Security Agency (formerly the United States ECA) to Indonesia, and the Government of Indonesia will co-operate by supplying three small fishing craft recently built in Japan. They will be used for demonstration purposes.

Fellowships

Provision is made for fellowships in most agreements as an adjunct to the expert's advice. On many occasions the fellowship is awarded to the counterpart assistant assigned to the expert by the country receiving aid. The purpose of the fellowship is to provide further technical training abroad in the field of endeavor covered by the project. Upon return to his home country he is expected to carry out the work instituted by the expert. Training may be given at a recognized educational institution of an FAO member country or at short courses offered by FAO in co-operation with governments ; or it may be obtained through visits to industrial plants or government institutions or be given through in-service training.

Project Administration

Requests for FAO's technical assistance originate with governments. Sometimes FAO officers are asked by governments to assist in formulating such requests. These usually state the problem involved, the type of assistance desired and what it is hoped to accomplish. Upon receipt at FAO Headquarters in Rome, the requests are channeled to the Division concerned and an appraisal is made. All requests are then considered by the Inter-Divisional Working Group of FAO. If this group concurs, a draft agreement is prepared in the appropriate Division. This is forwarded to the Chief of the Expanded Technical Assistance Program for approval and submission to the requesting government for signature. Following signature the project is put into motion by employing the necessary experts and despatching them to the country.

The duration of most fisheries projects is for one year, although some may be as short as four months. Provision is made to extend projects. In this connection, the project in *Haiti* has been extended one year, the fish marketing and fisheries biological projects in *Chile* by six months, the reconaissance survey in *Brazil* by two months, the fisheries technological project in *Ecuador* by six months, and the biologist for twelve months. Experts can be employed from any member country of FAO, but the receiving government must concur in appointments. Experts' salaries as well as their traveling expenses from their

homes to places of duty and return is paid by FAO. Board and lodging is furnished to the experts while in the country by mutual arrangements between the receiving government and FAO. The receiving government provides for travel, office space, interpreters, communications and other similar internal expenses.

Some fisheries agreements require the receiving country to provide fishing gear and craft when necessary and other miscellaneous items needed by the expert in his official capacity. FAO also may provide various items of equipment not readily available in the country, such as scientific apparatus for biological studies and motors to mechanize small local craft for demonstration purposes. In special cases small pilot plant equipment might be provided by FAO.

Upon conclusion of a project, all equipment provided by FAO remains the property of the Organization unless, by mutual agreement, it is left in the country for further demonstration or research purposes. In some cases, as in that of Thailand, the ECA financed the purchase of a large amount of equipment needed in conducting the inland fisheries project. In other cases, the receiving government might request some agency, such as the International Bank for Reconstruction and Development, for financial assistance in carrying forward the recommendations of the expert, e. g., the building of a fish harbor.

In order to shorten the time lag between the receipt of a request for assistance and assignment of an expert to the field, FAO is now establishing a " pool " of experts in Rome. Experts are drawn from the pool as projects develop in their field of work.

During the course of a project the expert submits monthly, or more frequently whenever possible, reports to FAO Headquarters in Rome. These are critically reviewed by officers in the appropriate technical divisions and guidance given to the expert as may be necessary or desired. In addition, officers from Rome Headquarters or from Regional Offices make field inspections of projects from time to time. Thus the various projects are continually under supervision and direction. Upon conclusion of the project, the expert prepares a final report to the government receiving aid. If the report seems outstanding and of possible general interest to other governments, a request is made to the receiving government for authority to publish it. Upon concurrence the report is then given public distribution.

The Expanded Technical Assistance Program of the Fisheries Division is thus supplementing the Organization's work and helping to fulfill its original intention which was to raise the standard of nutrition and living of peoples by the further utilization of the great resources of the waters of the world.

R. H. Fiedler

RECENT FISHERIES DEVELOPMENTS IN NORTH AMERICA AND EUROPE

as reported to FAO by Member Governments for 1950/51

The following article is based on annual reports covering the period 1 July 1950 to 30 June 1951 and submitted to FAO by various Member Governments. Only very few countries make these reports available to a sufficiently wide circle of readers ; it is hoped, therefore, that publication in the *FAO Fisheries Bulletin* will assist our readers. In condensing the reports, emphasis has been placed on everything indicating greater efforts of all kinds in fisheries industries. Particular attention has been given to work which has led to greater efficiency, production and consumption or is likely to lead to such increase within the next few years.

This article should only be taken to supplement other information, often of a more specialized nature, which is available on the various fisheries. Descriptive reports, most statistics on fish catches which are available in other publications, as well as work planned, have been excluded so that the main emphasis can be placed on accomplishments. In some few instances, the material has been supplemented by other information from recognized sources, but in most cases it reflects only the annual reports, and might, therefore, appear to be somewhat unbalanced in its content.

Although the reports are normally meant to cover the fiscal year 1950/51, the actual period covered is not the same for all countries, many of which use the calendar year 1950. As these countries' lengthy reports were not prepared on a uniform basis, considerable cuts have been made to ascertain some degree of uniformity.

Despite differences in approach and in size, all the reports are written in the spirit of Article XI of the FAO Constitution, where member nations take it upon themselves to " communicate periodically to the Organization reports on the progress made towards achieving the purpose of the Organization set forth in the Preamble and on the action taken on the basis of recommendations made and conventions submitted by the Conference."

This issue contains data from reports from North (including Central) America and Europe. Extracts from other regions will follow.

North (including Central) America

Canada

In 1950, the Canadian fishing industry continued to make progress in increasing its efficiency and reducing its dependence on markets that had difficult access. Improvements in catching and processing methods as well as in manufacture and marketing were reflected in the growing importance of higher priced products, particularly in the

expanding North American market. The efforts of the industry in this direction were in accordance with the objectives of the Government which had contributed much technical, economic and market information and had endeavored to stimulate public interest in fisheries.

In December 1949, the Government announced a development program applicable to fisheries throughout Canada. This program was based on plans to increase scientific research and facilitate practical application of research findings ; to extend conservation and development activities through planned biological-engineering projects ; to institute economic studies in production and marketing ; to expand inspection services and encourage greater consumption of fisheries products ; to study means of extending capital assistance for industrial and fisheries expansion, and to develop a greater understanding of the importance of the resources and industry in the social and economic life of the country. A study of methods to develop export markets, and encourage international policies to protect fisheries resources was to be included in the program.

To help carry out this program, new departmental services were established during 1950 including those for Consumer and Inspection, Conservation and Development, and Markets and Economics. These new government agencies were organized partly as a result of a rearrangement of duties already carried out by the Department of Fisheries, but mainly because of an increase in the services to the industry and the trade.

The protection and development of the fisheries resources of the country were under the jurisdiction of the Conservation and Development Service, which also, through its Fish Culture Branch, operated a number of hatcheries, re-stocked waters in areas where the fisheries were federally administered and looked after stream improvement and related matters.

The Inspection and Consumer Service had a dual role in that it was responsible for the inspection of fisheries products and worked towards making Canadians more fish conscious. Home economists were being trained in 1950 to give demonstrations in fish cookery across Canada. New fish recipes were being developed in a modern test kitchen installed at the headquarters, in Ottawa.

The Markets and Economics Service was responsible for research in production and markets, both domestic and foreign. In the course of 1950, special surveys were undertaken in the areas of production likely to become sub-marginal. Fish consumption studies were conducted in some urban centers. The general economic status of the industry was closely followed by this Service through collection and analysis of statistics generally.

Coincident with the announcement of a new program for the Department of Fisheries in December 1949, the Minister of Fisheries outlined a change in the Department's policy on Atlantic coast trawlers. Previously, licences for trawlers had been issued only to Canadian-built ships. Under the new policy, licences were granted to new trawlers built in the United Kingdom as well as the home yards. Licences were

also issued to the better types of second-hand trawlers bought either in the United Kingdom or the United States and registered in Canada after payment of the duty. Licences to second-hand trawlers were granted, however, only when the company had laid down a new keel in Canada.

This revised policy in connection with trawlers was designed to help the industry of the Maritimes, to take greater advantage of the stocks available and, at the same time, to help them meet demands for fresh and frozen fish. The people of the industry were able to modernize their fishing operations at somewhat lower costs than before and the trawlers themselves would help to stabilize supplies and maintain quality and variety of fish food for the consumer.

As a result of the easing of trawler restrictions, Canada's Atlantic coast trawler fleet was rapidly expanding.

United States of America

Production. In 1950, the fisheries of the United States and Alaska employed more people and utilized more fishing craft than ever before. The catch had an original volume of 2,222,600 metric tons and, at the fishermen's level, was valued at $365,000,000.

About 170,000 fishermen, a record number, manned over 10,500 documented vessels of 5 tons and over, about 48,000 motor boats and 34,000 other boats. In addition, about 1,500 transporting craft were operated by 4,000 men. Vessels added to the fleet in 1950 numbered 815.

Production Methods. The trend towards greater mechanization of gear and processing equipment continued as had the use of more durable material. Construction of steel fishing vessels and auxiliary equipment, such as scows, also increased. The freezing of salmon on Alaskan fishing grounds drew larger numbers of carrier vessels equipped for freezing and storage. *Neva*, a 100 meter combination vessel, elaborately equipped both for freezing and canning simultaneously, if desired, made its debut in Alaskan waters in the summer of 1951. About 3,500 cases of fish can be packed daily and 45,000 to 50,000 cases stored. The freezing capacity is about 18 metric tons daily of salmon or halibut with a storage capacity of about 900 metric tons. The use of freezer vessels was again being tested in the Gulf of Mexico shrimp fisheries, as a result of the expanded fishing areas.

Marketing Methods. The trend towards frozen consumer-size colorfully illustrated packages of fish accelerated as well as that for price-marked, cellophane-wrapped fresh fish in self-service counters. Experiments with packaged cooked fish products expanded. The Food and Drug Administration established standards of identity for oysters, and similar standards for tuna were nearing completion. The fishing industry took preliminary steps to suggest its own standards for breaded shrimp. National advertising of private brands of tuna was widespread. The Maine sardine industry successfully requested the Maine authorities

to tax its case pack and use the funds in the marketing of canned Maine sardines. Competition aroused the fish meal industry to publicize the values of its product.

Education and Research. The menhaden industry financed, and the United States Department of the Interior, Fish and Wildlife Service produced, "The Story of Menhaden," a 16 mm. color and sound film on menhaden production and the uses of menhaden meal and oil. Other films under consideration by the Fish and Wildlife Service and the fishing industry as joint ventures included subjects such as fish meal and oil, shrimp, depth finders, nets, New England fisheries, and king crabs.

In the Gulf of Mexico the Fish and Wildlife Service's biological and oceanographical vessel *Alaska* joined the exploratory fishing vessel *Oregon*. In the North Pacific the exploratory vessel *John N. Cobb* took albacore tuna with gill nets, located a new sea mount off the Washington coast, and found promising shrimp grounds in Alaskan waters.

Legislation. The 81st Congress initiated legislation which became Public Law 751 in that: "Except as otherwise provided by treaty or convention to which the United States is a party, no foreign flag vessel shall, whether documented as a cargo vessel or otherwise, land in a port of the United States its catch of fish or fish products, or any fish or fish products taken on board such vessel on the high seas from a vessel engaged in fishing operations or in the processing of fish or fish products."

In the legislation setting up the defence program, responsibility for food became a function of the Department of Agriculture. It, in turn, transferred the responsibility for the production and proccessing of fish to the Department of the Interior. A Defense Fisheries Administration, staffed by the United States Fish and Wildlife Service specialists and industry experts, was established in the Department of the Interior and assisted the industry in dealing with problems regarding material shortages and economic matters such as manpower and prices.

International Conservation Agreements. The Convention between the United States of America and Costa Rica for the Establishment of an Inter-American Tropical Tuna Commission, signed in Washington on 31 May 1949, came into force as of 30 March 1950, after ratifications by the two respective governments.

The Convention between the United States of America and Mexico for the establishment of an International Commission for the Scientific Investigation of Tuna, signed in Mexico City on 25 January 1949, was ratified by both signatories on 11 July 1950, when the first meeting of the Commission took place.

The United States is a member of the International Convention for the Northwest Atlantic Fisheries, signed in Washington on 8 February 1949, by delegates from Canada, Denmark, France, Iceland, Italy, Norway, Portugal, Spain, the United Kingdom and the United States, which had now come into force.

ECA - Technical Assistance Projects. Within the scope of the United States Foreign Economic Assistance Act of 1950, technical assistance was provided for several European (Marshall Plan) countries and to several areas in the Far East.

In the European area the ECA had financed fisheries study programs in the United States for Portugal, Denmark and Iceland. These involved fisheries biological research methods, biochemistry, microbiology and similar scientific problems. The work in connection with fisheries research, modernization of fishing and of the markets was continued throughout 1950 in Greece, where considerable improvement in fish supplies and marketing was noted.

As a part of the Far Eastern Program, funds were provided to re-establish the Indonesian Fishery. Small motorized fishing boats were purchased in Japan as were a number of engines to motorize existing Indonesian fishing craft. A fully equipped research vessel, as well as laboratory equipment for a land research station, were also provided. Engineering services were provided for the development of cold storage and ice making facilities, primarily for fish, in Thailand and Indo-China.

Training of Experts in Fisheries. The United States Government, through the Fish and Wildlife Service, continued various training programs in the field of fisheries. During 1950, the last of the 125 Philippine students authorized to receive training in the United States returned home. Trainees from Peru and Brazil received training in fisheries biology, technology and fish culture under grants awarded by the Director of the Fish and Wildlife Service, who had also accepted two Japanese leaders in fisheries legislation and administration for short periods of training.

Point IV Program. In late 1950, the United States Fish and Wildlife Service, at the request of the Government of Mexico, renewed the Fishery Mission to Mexico, which has been in force since 1942. The Fishery Mission to Peru, established in 1949, had been active in developing plans and programs of fisheries research, management and administration. In May 1951, the Mission was enlarged by the assignment of a fisheries biologist and a fisheries products technologist. Peru has completed a fish storage terminal and technological laboratory, and planned to construct a fisheries biological laboratory and an exploratory fishing vessel. The United States Fish and Wildlife Service has received many enquiries and requests from foreign sources for such technical aid.

Hawaii

The total catch landed in 1950 was some 8,000 tons, valued at approximately US$400,000. More than half the catch was tuna, most of which was subsequently canned.

Research in fisheries is receiving active support from territorial and federal agencies. The Pacific Ocean Fisheries Investigation Program

under the Fish and Wildlife Service of the United States Department of the Interior carried on major studies in biology and oceanography which would lead the way towards a better understanding of the available fisheries resources of the Pacific Ocean. Two territorial agencies, the Board of Agriculture and Forestry and the University of Hawaii, carried on biological and functional gear research programs designed to improve the efficiency of fishing operations in Hawaiian waters.

Puerto Rico

The ocean fish catch in 1950/51 was estimated at 3,000 metric tons, valued at $977,000 to the fishermen, and representing an increase of 1,100 metric tons over the 1947/48 catch. The increase in production was attributed, in part, to the activities of two modern fishing clippers ; one operated privately and one by the Insular Government, with both fishing for grouper in the waters off the Bahamas, Cuba, Ecuador and Gulf of Mexico. Native vessels engaged in inshore fishing also contributed to the increase in production.

Fresh-water fishing ponds, with an area of 2,676 ha. were expected to produce 280 metric tons of fish in 1951. These ponds, covering former arid areas, were stocked with North American fish, including large-mouth bass, bluegill, sunfish and catfish, thus providing both food and recreation.

An Insular Government law adopted in April 1951 provides US $20,000 to (1) procure and distribute among fishermen materials needed for the construction of gear and equipment ; and (2) provide fishermen with credit for the purchase of boats and fishing gear.

The fisheries of Puerto Rico employ approximately 2,700 fishermen, according to a survey made in February 1950. The surveyor also indicated that 474 dories, 43 motorboats, and 309 sailboats were operating at that time.

British Territories in the Caribbean

Following the visit of the Fisheries Adviser from the Colonial Office in 1949, several territories were able to put into effect some of his recommendations for intensifying or improving the efficiency of their fisheries work. As several experts have pointed out in recent years, the potentialities of the waters readily accessible to the British Caribbean territories for increased fish production are in most cases definitely limited, and substantial developments in sea fishing are not to be expected.

Attention was paid to the provision of adequately trained staff, and Barbados, British Guiana, British Honduras and Jamaica now have Fisheries Officers who had recently undergone courses overseas. Fresh-water fish were introduced into several territories and preliminary results in at least one territory were encouraging. In British

Honduras, the Fisheries Officer was provided with a fishing smack and crew for exploratory work over an initial period of six years. Fisheries development in Jamaica was made the responsibility of the Forestry Department, and a fisheries policy for the island was formulated. A promising fish drying and salting industry was established in Canouan, one of the small islands in the St. Vincent Grenadines group.

Surinam

As a result of the development of fisheries, the quantity of fish made available to the population was higher than in previous years and, in consequence, the imports of fish showed a considerable decline. An experiment center was established for the further development of fisheries on estates. A modernly equipped cutter provided with an echo sounder, etc., was put into service for the study of various fisheries problems in the coastal waters and at sea. Information was given on the handling of nets. The supply of ice was improved by the installation of ice and refrigerating machines in places remote from fish markets.

Europe

Austria

Production. Austria's fresh water fisheries produced some 1,300 metric tons in 1950.

A considerable increase in production of marketable and stocking fishes was achieved in fish culture stations. Between 1949 and 1950 production of marketable carp was raised by about 23 percent in Lower Austria, 20 percent in Upper Austria, 66 percent in Salzburg and 14 percent in Styria, which are the only provinces where carp breeding in ponds is of any importance.

Apart from financial means provided in the country, the production increase was made primarily possible by a grant of ERP funds and government aid. The subsidies were instrumental not only in raising fish production but also in improving its quality.

The fish hatcheries also developed favorably. Special mention should be made of the new hatchery at Kreuzstein (Mondsee) which had reached full capacity in the 1950/51 breeding season. It chiefly produces fry for the Austrian lakes and is concerned with hatching fish ova which cannot be produced in sufficient quantities elsewhere.

The equipment of the Wallersee station was enlarged by accessory buildings and enclosed. Its special importance lay in breeding pike fry.

Other hatcheries were also enlarged and adjusted with a favorable effect on fish production. Compared with the 1949/50 breeding season fish ova production in 1950/51 increased some 14 percent in Lower Austria, 16 percent in Upper Austria, 5 percent in Salzburg, and 20 percent in the Tyrol.

Besides the increased fry production, there was also a better supply of marketable fish, especially trout. Increased production made it possible to intensify export of fish for stocking purposes.

The Federal Institute for Fisheries Biology at Weissenbach started scientific and economic investigations of fish production in dammed-up lakes, which were continuously increasing in number.

Similar studies were made on the value of fish passes in rivers with several locks.

Marketing. Marketing the domestic production of fresh water fish was satisfactory; some stagnation occurred only when greater quantities were put on the market. Efforts were being made to send a more regular supply to the markets and to stabilize prices.

Research and Advisory Service. The Federal Institute for Fisheries Biology in Weissenbach, to which a fishery school is annexed, was enlarged by a new modern research building on the shores of the Mondsee.

A fisheries exhibition was held as a part of the 1950 Viennese Autumn Fair. At the same time, the first national fisheries meeting was held. Similar events included the fishing week at Hallstatt, the meeting of the salmonide breeders, and the autumnal meeting of the Fishery Working Group in Klagenfurt.

Special importance was attached to advisory work in individual fish culture operations. In Lower Austria, 67 visits were made to ponds to advise on technique and management; in Upper Austria, 38 district meetings were held to discuss general and current issues; in Styria, 8 courses were held on fisheries and water management. In addition, current advice on business management was given to about 50 firms. The fisheries meeting of Styria offered a good occasion for informing officials and fishermen of current problems and possibilities in fisheries. Extension work in fisheries was also going on in other provinces by means of excursions, training courses, fisheries meetings, special lectures, regular visits to fish culture centers and by individual advisory work.

Belgium

Output in 1950 was less than in previous years owing to the failure of the herring fishery. The fleet was reduced by 17 units accounting for 6,500 h.p. and 4,300 gross registered tons (g.r.t.).

In 1950, a second fish freezing plant was established. Situated in Zeebrugge, it was designed for regulating supplies as already done by the plant in Ostend, thus serving both the fresh fish markets and the processing industries.

The freezing plants contributed to price stabilization which is a great advantage in the processing industries. Unfortunately, these plants are only parts of the whole cold chain which is necessary to give perfect service to the processing industry and to retailers.

A good retail organization might increase the consumption of

good fish considerably. The wide experience gained in the past indicated the need for coping with the dispersion of interests in the retail trade. The Commission for Fish Propaganda initiated action to this end; its first task was to review conditions in the various parts of the country, and information was collected on population in each municipality, their local trade organizations, fish consumption and the need for distribution facilities.

An act of 11 March, 1950, providing the basis for action against pollution of waters, was not yet in force. Certain local authorities initiated stocking of inland waters; in the Luxembourg province, for example, 300,000 Belgian francs were allocated for stocking streams.

France

The Fleet. The war reconstruction of the French trawler fleet was complete but the problem of replacing old units was still present. It was estimated that craft amounting to 30,000 g.r.t. were old and needed replacing.

Because of the greater efficiency of the new trawlers, it was considered unnecessary to replace the old units by an equal number of new ones and it was decided to grant assistance for the construction of only 15,000 g.r.t. This construction plan was to be carried out over a period of 5 years, with the financial help of the Crédit maritime et fluvial.

The new units were to be as standardized as possible and it was most probable that only two types of 32 and 42 meters (105 and 138 ft.) respectively, all fitted with internal combustion engines, would be built.

Due to the prevailing high cost of fuel, most steam trawlers were in a difficult financial position. Credit facilities, through the Crédit maritime et fluvial, were to be granted for the financing of the replacement of steam engines by diesel motors on the trawlers on which such change was possible.

The wooden fleet also needed replacement. The Crédit maritime et fluvial could not grant credit for this purpose but the assistance of the Crédit maritime mutuel, to which the state allotted 600 million francs, was possible. However, the financial possibilities of the Crédit maritime mutuel were still limited.

Consumption Promotion. The French Fish Propaganda Committee was planning more action in the future. Its action had been hampered by the lack of finances, as it was supported only by the trade of some fishing harbors and received no funds from the state.

It was decided that the Committee would be granted an annual contribution of 10 million francs from the state, while the Central Fisheries Committee, consisting of shipowners, fishermen, wholesalers, fish curers and fish canners, would match this amount.

Inland Fisheries. In 1950, a program of work of general interest for fish culture was planned, including protection of the existing fish

population, necessary installations to enable migratory fish to reach the natural spawning grounds, and restocking of rivers.

To protect migratory species (salmon, sturgeon and shad) it was planned to restrict the granting of hydraulic energy concessions. In rivers of one category no further concession of hydraulic energy would be granted at all, nor any extension which would make fish migration more difficult. In all other rivers, concessions would be granted only within the limits provided by law : height of fall under 7 meters (23 ft.), inlet flow under a certain proportion of the river module, free flow at least equal to a certain proportion of this module.

In 1950, a 35 million franc fisheries equipment program was realized. It included the repair of many dams to maintain a normal water level in fishing areas, creation of fish passes, equipping supplementary spawning ponds, creation of a trout population through trout culture in Lozère, providing weed-clearing boats to a certain number of fisheries and fish culture federations.

A fish culture center for the production of trout fry was created in the Department of La Réunion.

Much legal and technical work was done to prevent the pollution of waters.

Greece

During 1950/51 the fisheries program was further developed. Improvements were noted in the construction of fishing boats, in installing and equipping engines with all modern equipment. For this purpose 7,000 million drachma (US$ 465,000), were made available to fishermen through the Agricultural Bank of Greece, by medium and long-term loans. This stimulated fisheries production, which increased for this period to some 55,000 metric tons.

The improvement of trawlers also gave good results. Trawlers were equipped with sounding and refrigeration equipment through former ECA funds. Funds were also made available to fishermen for building new boats fishing with ring nets.

Improved species of oysters, imported from France, were introduced in suitable locations of the Greek seas. From the former ECA Mission funds amounting to 1,600 million dr. (US$ 100,000) and $30,000 were included in the fisheries budget for the establishment of new fish processing industries and for improving existing ones.

Ireland

Sea Fisheries. The government's policy continued to be directed towards the improvement of the catching power of the fishermen. The Irish Sea Fisheries Association Limited (an officially sponsored society of fishermen) now has three boatbuilding yards in operation and a sum of £ 80,000 (US$ 223,900) was made available to it in the financial year 1950/51 to supply its members with boats and gear on hire purchase terms.

Inland Fisheries. Schemes for the improvement of brown trout fisheries were continued ; they are designed to study the effect on the growth rate of trout, of adding nutrients to the waters, and the effect on trout stocks of the removal, in varying degrees, of predatory fish such as pike and perch. As an extension of these schemes it is proposed to plant in alkaline waters, at present understocked, the fry of trout indigenous to acid waters in which their growth is retarded.

The Netherlands

Old and small ships were eliminated from the trawler fleet. No changes were made in the lugger fleet since its reconstruction during the first postwar years. The cutter fleet increased and many old cutters were replaced by modern ships. Plans were in preparation to replace more old trawlers and luggers by modern vessels.

The fresh water fishery was confronted with great difficulties as a result of export restrictions. Eel catches in Lake Yssel were good and big profits were made from them in 1950. However, generally speaking, prospects for the fresh water fishermen were far from bright.

Norway

The development of fish processing plants continued during 1950. However, investment activities decreased somewhat owing to the restriction imposed by the public authorities.

Both first and second priority mortgage loans granted for fishing craft by the State Fisheries Bank increased greatly in 1950. The manpower situation in the fishing industry, which previously had a tendency to become tight, gradually eased. This was largely due to the surplus of manpower in northern Norway owing to diminishing investments in fish processing plants and other building and construction projects.

Continued efforts were made to assist fishermen who desired to move away from distant fishing settlements.

For the benefit of Norwegian fishermen participating in the fisheries off West Greenland, extensive welfare activities such as the building of dwelling and community houses, were undertaken with government support.

Plans were being made for the introduction of a daily money allowance during illness to fishermen under the health insurance scheme.

In Norwegian marine research, activities were continued along the same lines as outlined in the preceding report. The marine research vessel *G. O. Sars* made two journeys in the Norwegian Sea, the first in the summer of 1950 and the second in December 1950 to January 1951. Both of these voyages contributed greatly to extending knowledge of the location of sexually mature herring outside the actual spawning season. Tagging tests on herrings revealed important facts which added to the knowledge of herring migration.

Cod investigations were also extended, partly by the voyage of the research vessel *G. O. Sars* in the Barents Sea, and partly by means of the tagging tests.

The Chemical-Technological Research Institute of the Directorate of Fisheries continued its experiments with preservation agents for winter herring as raw material for the herring oil industry. The Institute continued its cooling and freezing experiments of various raw materials and extended its activities to a number of other fields of research. The Research Institute of Economic Management under the Directorate of Fisheries commenced studies of fishermen's annual accounts, based on the compulsory accounts which borrowers from the State Fisheries Bank are obliged to keep.

Sweden

The Swedish salt water fisheries which, during the first postwar years, enjoyed a period of good catches and favorable markets, were faced with certain marketing difficulties in 1950.

Legislation. In January 1951, a new law on fishing rights became effective. As in the old law, the new law stipulated that landowners, as a matter of principle, had the sole right of fishing in rivers, in most of the lakes, and within specified areas at the sea coasts and at the coasts of the larger lakes. Some exceptions were made which give fishermen, not landowners, increased freedom of movement. On the Swedish west coast, where fishing was most intensive, the landowners' former monopoly of fishing was almost completely abolished. As far as fishing in coastal waters is concerned, the Swedish legislation on the right of fishing was basically in line with corresponding legislation in other Western European countries.

Education. The training of officials for local fishery boards,[1] which are advisory bodies with certain administrative functions, was formerly arranged by a government supported private association. Beginning in 1951, the Government assumed responsibility for this training, and the period of the training course was increased from 11 to 17 months.

During the previous year, government grants were made available for field courses and study trips for fishermen. This program aroused considerable interest which induced the authorities to make additional funds available for this purpose in 1951.

United Kingdom

White Fish Industry. The year 1950/51 was a critical one for the British white fish industry. It opened with the industry suffering

[1] Rural Economic Societies which *inter alia* carry out extension activities in agricultural and fisheries matters.

from the effects of a price slump which set in before the end of October 1949 and persisted throughout the winter months, despite the lifting of the price control in April, until early gales in September reduced the catches. In the summer months when fish is normally plentiful, fishing was restricted by the industry because the prices were unremunerative. Trawlers were laid up in large numbers and new vessels were tied up before being commissioned.

As an immediate interim measure, the Government granted a subsidy to the inshore, near and middle water sections of the industry, for a period of six months from 31 July 1950. The subsidy was continued for a further six months until July 1951.

In the autumn, the distant water trawler owners at the Humber ports, who had no part in the subsidy, agreed among themselves on a scheme of restriction of catches with the main object of making quicker trips and landing smaller quantities of fish in better condition. Later, the market recovered, and the restrictions were first eased and finally, in January 1951, suspended altogether.

The Sea Fish Industry Bill was introduced in December 1950 and received the Royal Assent on 10 May 1951. The Act created new machinery for a thorough attack on the white fish industry's long-standing difficulties. It set up a White Fish Authority with wide powers, composed of five independent members selected for their outstanding ability but not themselves connected with the fishing industry ; they would be advised by an expert White Fish Industry Advisory Council composed, apart from the independent chairman, of representatives of sectional and other interests. The Authority was given a wide range of powers to foster the development of the industry, of which the most important items in a long list would perhaps be the powers to make advances for rebuilding the near water fishing fleet to carry out and promote further research and experiment. It was empowered to make regulations subject to parliamentary confirmation, to raise commercial standards in relation to the handling, stowage, landing and sale of white fish. It was also given general power to submit schemes for the approval of Parliament embodying specific plans designed to reorganize, develop or regulate the white fish industry. Such schemes might, for example, provide for measures to prevent the over-production of fish from distant waters, and to improve distribution. Lastly, the Authority had licensing powers which would enable them to prevent overfishing.

Members of the Authority were appointed as members-designate in advance of legislation on 6 September, 1950, and were formally appointed on 31 May, 1951.

Herring Industry. Faced with a serious marketing problem, in 1950 the Herring Industry Board carried out a home market promotion scheme in two limited areas of England and proposed to follow this up in 1951 by a large-scale campaign throughout Great Britain. First shipments of high grade, quick-frozen kippers were made to the United States in the latter part of the year and the Board tried in

various ways to overcome the obstacles in prewar European markets and to open up new markets elsewhere. In order to deal with the larger quantities of herring diverted to oil and meal factories, approval was given to plans put forward by the Board for the erection, with Government assistance, of factories at five of the main herring ports.

Biological Research. One of the projects included in the British fisheries research program — forecasting herring catches — became a regular service; but research continued, with the aim of making the forecasts more precise. The actual catches for 1950 proved the forecasts.

In the earlier part of the season, a first attempt to guide summer herring fishing in the light of surveys by echo sounding was not successful, owing perhaps to its novelty, but also because the herring stayed too deep for the drift nets. The method, however, remained promising.

Arrangements were made for the collection of more detailed statistics on Scottish herring catches and associated conditions in the Scottish fishery than were possible previously. Such statistics (more or less comparable to those provided by trawl fisheries) were essential for projected herring research.

Scientific developments included more returns from external herring tagging, which were beginning to provide, for the first time, sound information about herring movements in the northern North Sea.

The identification of six species of fish by the appearance of echo sounding traces was completed and reported on for publication. Photographs were to be shown for fishermen's guidance.

A forecast of the Scottish haddock fishing was prepared. In particular a long-term correlation between haddock brood and the dominant winds over the northern North Sea year by year showed a surprisingly close relationship.

Research on Arctic cod resulted in associations between the cod catch and particular temperature, in certain localities and months, being reported to the industry through the press.

Shellfish research, mussel cleansing and oyster rearing made progress and oysters were put on the market from certain derelict grounds in Essex, which were being restored by the Ministry of Agriculture and Fisheries.

Practical gear tests (both trawl and seine) were continued and provided further information about the efficiency of different types of gear. In particular, underwater photography was used in this work, as well as recording by echo sounder. Preliminary experiments on the shrinkage of different types of twine were made.

A program of research was being carried out at Pitlochry into the factors affecting the number, size and growth of brown trout. Investigations were also being carried out in rivers and on the coast of Scotland into the life history of salmon and sea-trout, their migration, growth and habits, with the object of elucidating many problems of administrative and economic importance as well as of scientific value.

G. M. Gerhardsen

Conferences and Meetings

Caribbean Fisheries Conference

The Caribbean Commission held a fisheries conference in Trinidad, British West Indies, 24-28 March 1952 in association with the Caribbean Research Council. The conference was attended by delegates from the United States of America, Puerto Rico, French Caribbean Departments, Surinam, Barbados, British Guiana, British Honduras, Trinidad and Tobago, Dominica, Grenada and St. Vincent. In addition, observers were present representing FAO, the Canadian Trade Commissioner's Service, as well as representatives of co-operative and local commercial interests, and a strong contingent of scientists and marine biologists working in the Caribbean area. The Conference, which was opened by the Hon. Victor Brian, Minister of Agriculture in Trinidad, quickly settled down to a large agenda with Mr. Dudley Wiles, of Barbados, in the chair.

In the course of its regular sessions, the Conference reviewed, with the help of extensive documentation prepared beforehand, the occurrence and distribution of commercial species of fish (including shellfish) in the Caribbean ; techniques practised there for fish capture ; types of fishing craft in use ; marketing, storage and distribution of fish and fish products ; methods used for conserving and processing ; the cultivation of fish in ponds ; and the application of recent technical knowledge about the exploitation and development of new fisheries.

Recommendations covering a very wide range of technical matter were adopted, and are conveniently tabulated in the Conference Report. These dealt with such topics as fish nomenclature, legislation to control the use of poisons and explosives for the capture of fish ; placing important materials used in fisheries on the same basis for duty purposes as agricultural equipment and machinery ; small operator industries as, for example, for fish meal ; net preservatives ; exchange of information on the successful introduction of new gear (e. g. gill nets for flying fish as developed in Barbados) ; marketing, credit unions and loans to fishermen ; and the education of fishermen.

Of special importance were the adoption of a well-considered fisheries research program in the Caribbean area presented by Dr. F. G. Walton Smith, Director of the Marine Laboratory, University of Miami, Florida, U. S. A. ; recommendations on the strengthening of fisheries administration by the appointment of further territorial fisheries officers ; and the provision of facilities for exchange of information between them and for periodic meetings.

In addition to the regular sessions, Dr. Walton Smith conducted a seminar on Caribbean research problems ; W.H.L. Allsopp, of British Guiana, showed and discussed his slides to illustrate fishing activi-

ties in his country ; and there were two field trips, one to some fish ponds and the other to the fishing village of Icacos.

Two papers were given by Dr. B. F. Osorio-Tafall, FAO Regional Fisheries Officer for Latin America. In the first, he described the form and functions of the FAO regional fisheries councils. Latin American governments have expressed their mutual interest in forming such a council to promote the development and proper utilization of the aquatic resources of Latin America. A formal inaugural meeting will be convened in Montevideo later this year. The Conference recommended that the attention of the metropolitan governments be drawn to the advantages that would accrue to the Caribbean Territories through membership in the Latin American Fisheries Council.

He outlined the philosophy underlying the technical assistance afforded by FAO and other United Nations' agencies, and gave many examples of successful fisheries projects completed, or in operation, in various parts of the world. Of particular interest was his description of the fisheries training and demonstration centers FAO is conducting. He invited the Conference to bring to the notice of their governments the advantages to be derived from attendance by fisheries officers and others at the next Latin American Fisheries Training Center, to be opened early in 1953. The Conference warmly welcomed Dr. Osorio's paper, and recommended that the Commission be asked to use its good offices to ensure the supply of technical assistance to Caribbean territories.

Fisheries Division Activities

Latin American Fisheries Training Center

The FAO Latin American Fisheries Training Center (LAFTC) was opened in Valparaiso, Chile, from 6 January to 14 March, 1952, under the joint sponsorship of the Chilean Government and FAO, with the co-operation of other international agencies. The Director of the Chilean Fish and Wildlife Service, Commander Exequiel Rodríguez, was designated by the Chilean Government as Director, and the FAO Fisheries Officer for Latin America, Dr. B. F. Osorio-Tafall, was designated by FAO as co-director.

The Santa María Technical University made the necessary lecture halls, dormitories, office space and other facilities, etc. available, thus all transient delegates were able to have accommodation at the Center itself.

About 50 delegates, including 14 observers, from the following countries participated in the complete course : Brazil 2, Chile 35, Ecua-

dor 5, El Salvador 2, Paraguay 2, Peru 2, Uruguay 2. Several other interested persons and students also attended part of the courses.

The following is a list of the instructors and subjects covered by their classes: Dr. Jorge Ahumada (ECLA), Appraisal of Fisheries Projects; Jorge Alarcão (FAO), Fisheries Statistics; Richard S. Croker (U.S.A.), Fisheries Administration; Dr. Fernando de Buen (Uruguay), Economically Important Families of Fishes; Dr. Carlos González (Argentina), Sanitation of Fishery Products; Mogens Jul (FAO), Handling and Refrigeration of Fisheries Products; Antonio Landa (Peru), Analytical Biological Fisheries Statistics; Milton J. Lobell (Chile), Fishing Methods, Craft and Gear; Dr. Antonio López-Matas (Chile), Canning and Curing of Fish, Fish By-products; Dr. B.F. Osorio Tafall (FAO), Latin American Fisheries, the Living Aquatic Resources and their Importance for Man; John C. Marr (U.S.A.), Marine Fisheries Management; Valentín Paz Andrade (Spain), Fisheries Economics; Felipe Quezade (UN), Economic Geography of Latin America; Dr. Gerardo H. Schwabe (Chile), Molluscs and Crustaceans of Commercial Importance; Dr. Erwin Schweigger (Peru), Elements of Oceanography; Dr. Rui Simões de Menezes (Brazil), Utilization of Fresh Water Fisheries Resources; Sven Somme (Norway), Fisheries Extension Service; Dr. Parmeño Yañez (Chile), Introduction to Fisheries Literature.

In addition to some of the instructors mentioned above, the following persons assisted in conducting special seminars: Dr. Kotok (FAO), Dr. Erik Poulsen (Denmark), Dr. Robert Smith (U.S.A.), Dr. Arturo Vergara (FAO), Dr. Julio Luna, F. Jimenez Cisneros, A. Rendíc and Dr. Edwin Reed (all of Chile),

The Training Center was organized with four daily classes, each of 1½ hr. duration. About half the time allotted for each class consisted of a lecture, the remaining time being used for discussions. All lectures were given in Spanish (those given by the few non-Spanish speaking instructors were translated paragraph by paragraph). It appeared as if this interpretation procedure worked very well and caused little delay or other difficulties for the delegates or instructors. Each delegate had occasion to choose a field of special interest, either biology, economics or technology. The daily courses were organized so that two classes covered general fisheries subjects and were attended by all delegates while the remaining two were devoted to the specialized subjects.

All lectures presented at the Center were mimeographed and distributed to the students, in most cases before or almost immediately after the classes. Due to the very large amount of work involved, however, some copies were not finished until after the termination of the course, and were mailed to the participants. The material consisted of over 2,000 mimeographed pages and covered subjects about which, so far, little has been published in Spanish. The participants found the material most useful, and FAO is now considering the possibility of having part of it reproduced in book form.

In addition to the daily classes, seminars were generally arranged in the late afternoon and on Saturday mornings.

Two public forums were organized in Valparaiso with the participation of delegates and instructors from the Training Center and interested persons from Valparaiso. At each of these forums three delegates presented papers.

A considerable number of excursions and industrial visits were arranged. Trips were made on two trawlers where delegates had occasion to participate in oceanographic work and biological studies and to observe several shooting and haulings of the trawls.

Of special interest to the delegates who specialized in fisheries biology were trips to Talcahuano, where studies of the effect of industrial pollution were made, and to Río Blanco where a fish hatchery was visited.

For those delegates specializing in technology work trips were arranged to a whale shore station, fish refrigeration plant, drying and salting plants, a can manufacturing plant, canneries, a fish factory ship, a lobster transport vessel and an ice and cold storage warehouse.

All delegates had occasion to visit the Marine Biological Station of the University of Chile at Montemar, about 8 km. from Valparaiso, and to acquaint themselves with the library and documents services of this station.

Delegates and instructors were given a reception aboard a Chilean cruiser and others by the Maritime League of Chile, the Municipality of Valparaiso, the local Rotary Club, etc.

On the last day of operation of the Training Center, a bronze plaque was dedicated to the Technical University Federico Santa María by the professors and trainees as a token of gratitude to the University.

The closing ceremony, presided over by the Minister of Economics who was representing His Excellency the President of the Republic, was held in the auditorium of the University of Chile in Santiago. Commander Rodriguez read an address sent by Dr. Finn, Director of the FAO Fisheries Division. Dr. V. Bertullo, a trainee from Uruguay, spoke in the name of the trainees and Dr. Osorio-Tafall summarized the work performed. The Minister of Economics presented certificates issued by the LAFTC to the trainees who had successfully completed the course.

The accomplishments of the Training Center may be judged by the opinion which Richard S. Croker, Chief of the Bureau of Marine Fisheries, State of California Department of Fish and Game, U.S.A., expressed in a letter to FAO and of which parts are being reprinted with his permission :

" Most gratifying of all was the attitude of the student body. They were the most enthusiastic and sincere group of people that one could imagine. They gave every indication of being at the Training Centre to learn. It was certainly an outstanding group of young men. They were selected wisely ; and, even more important, the Director of the School had somehow imbued them with a real spirit. I have nothing but praise for that aspect of the School.

" As for the training program itself, I felt that it was very well rounded out ; and as a result, gave the delegates a concentrated dose of knowledge regarding the fisheries .....

" Many of the participants told me how much they appreciated the opportunity to attend, and that they had learned more than they had thought possible in such a short period. I am sure that the great majority of them returned to their countries with a better appreciation of the problems that face them, and with better knowledge to solve these problems "

The ultimate success of such a training center can probably best be measured by the degree to which participants are active in work aimed at fisheries development after the completion of the course. It is gratifying to note that an industrial fisheries training center will be inaugurated on 23 May 1952, at the University of Chile in Santiago. The Chilean Minister of Education will be chairman of the center, in which 50 students are enrolled. Francisco Pérez Aguila, who participated in the FAO Training Center, is actively organizing it. The courses will include Navigation, by Julio Luna ; Fishing Gear and Boats, by Milton J. Lobell ; and Oceanography, by B. F. Osorio-Tafall.

General Fisheries Council for the Mediterranean

This Council became a reality on 20 February 1952, when notification of acceptance of the Agreement to establish such a Council was received from Israel by the Director-General of FAO. Earlier acceptances had been received from Egypt, Italy, the United Kingdom and Yugoslavia. Subsequently Greece accepted the Agreement, bringing the total to six.

The Agreement to establish the General Fisheries Council for the Mediterranean was formulated at a meeting convened by FAO in Rome, 19-24 September 1949, and attended by representatives of France, Greece, Italy, Lebanon, Turkey, the United Kingdom and Yugoslavia. The functions of the Council are :

(*a*) " to formulate all oceanographical and technical aspects of the problems of development and proper utilization of aquatic resources ;

(*b*) " to encourage and co-ordinate research and the application of improved methods employed in fishery and allied industries with a view to the utilization of aquatic resources ;

(*c*) " to assemble, publish or otherwise disseminate, all oceanographical and technical information relating to aquatic resources ;

(*d*) " to recommend to Member Governments such national and international research and development projects as may appear necessary or desirable to fill gaps in such knowledge ;

(*e*) " to undertake, where appropriate, co-operative research and development projects directed to this end ;

(*f*) " to propose, and where necessary to adopt, measures to bring about the standardization of scientific equipment, techniques and nomenclature ;

(*g*) " to make comparative studies of the fishery legislation of different countries with a view to making recommendations to its Member Governments respecting the greatest possible co-ordination ;

(*h*) " to encourage research into the hygiene and prevention of the diseases peculiar to the calling of fishermen ;

(*i*) " to extend its good offices in assisting Member Governments to secure essential materials and equipments ;

(*j*) " to report upon such questions relating to all oceanographical and technical problems as may be recommended to it by Member Governments or by the Food and Agriculture Organization of the United Nations and, if it thinks proper to do so, by other international, national or private organizations with related interests ;

(*k*) " to report annually upon its activities to Member Governments and to the Conference of the Food and Agriculture Organization of the United Nations ; and to make such other reports to the Food and Agriculture Organization of the United Nations on matters falling within the competence of the Council as may seem to it necessary and desirable. "

As in the case of the Indo-Pacific Fisheries Council and the proposed Latin American Fisheries Council, the secretariat will be provided by FAO.

At the kind invitation of the Government of Greece, the initial meeting of the Council will be held in Rhodes in July 1952.

Assistance to East Pakistan

W. H. Schuster, FAO fish culturist, spent most of April in East Pakistan making a general survey of inland fisheries and advising specifically on the solution of problems encountered in the cultivation of embanked areas of rice fields in the lower part of the Ganges delta. Schuster left Dacca on 5 April, 1952, by river steamer and traveled continuously in launches and steamers until the 18th. In every district through which he passed he discussed fisheries problems with local officers and made several suggestions for improvement.

East Pakistan has about 200 square miles of reclaimed land embanked by low dykes (bheries). Drainage canals divide the embanked areas into plots, the greater part of which, during the monsoon, is used for growing rice, and the remainder for fresh water fish culture. Brackish water is allowed to enter the embanked areas at successive high tides, bringing with it large numbers of fry of mullets, *Pangasius*, *Lates* and prawns. Schuster reports that in order to secure as many fry as possible excessive amounts of saline water were allowed to enter, causing failures of the rice crops and contributing to the acute famine which at present afflicts the bhery area. To counteract this, he recom-

mended that the quantity of saline water be restricted and that the embanked areas be stocked with fry caught in the rivers. He says that millions of these fry are at present being caught and going directly into consumption.

Schuster also surveyed large areas of low lying rice fields which become flooded during the monsoon. Scattered amongst the rice fields and villages there is a large number (200,000 have already been counted) of fish tanks or ponds. He made suggestions for their improvement. He found that the paddy fields resemble quite closely areas in Malaya and Indonesia which produce great yields of *Trichogaster pectoralis* (Sepat siam). Since the paddy fields of East Pakistan have a suitable pH factor and an almost over-production of plankton, Schuster feels that a great increase in fish production can be achieved through proper stocking practices.

Schuster proceeds to Indonesia on the completion of the East Pakistan assignment to participate in the FAO Fish Culture Seminar at Djakarta and Bogor 1 May to 15 June. He will present a paper on the "Development of Extension Services for Culture of Fish in Rice Areas" to the Third Meeting of the International Rice Commission which meets in Java from 12 to 16 May 1952.

Proposed International Fishing Boat Conference

Partly as a result of the article in *FAO Fisheries Bulletin* (Vol. 4, No. 1), "Improvement in the Design of Fishing Boats," by Jan-Olof Traung, FAO naval architect, many countries have expressed interest in attending an international fishing boat conference. However, currency and other restrictions would make it difficult for many of them to send representatives long distances. The Division is giving thought to holding two conferences with the same papers presented at each and at least two major contributors attending both conferences to give the second one the benefit of discussions at the first. There would be one report covering both meetings. It is planned that one meeting will be held in North America and the other in Europe.

The idea of such an international meeting is by no means a new one and has been propounded by such leading authorities as Capt. Fred Wallace, Editor of the *Canadian Fisherman* and Commander A. C. Hardy, British naval architect. Commander Hardy visited FAO Headquarters in April to advise on the organization and program of the conference.

Personnel

H. Kristjonsson, of Iceland, took up his duties with FAO on 10 March 1952 as a fisheries technologist. He studied engineering in California and has had experience in operating various fishing gears in commercial fishing off Iceland. He was formerly Director of the

Icelandic state herring oil and meal factories, and more recently worked with a company specializing in designing fish processing plants and importing equipment for the fishing fleet and industry.

Notes on Films

THE RISING TIDE. Producer and distributor: National Film Board of Canada, Ottawa, Canada. Technical data: 16 mm. and 35 mm., black and white, sound, 1,100 feet, 31 minutes running time, commentary and titles in English or French. Price: 16 mm. print $58.99.

Describes in considerable detail the development of the co-operative movement among the fishing population in eastern Canada, and how, in earlier times, the standard of living was very low. The food was monotonous: fresh fish in summer and dried fish in winter. The fishermen were generally dependent on only one buyer and often had to accept very low prices. Conditions were such that many fishermen decided to leave the fishing centers and seek employment elsewhere. On the advice of J. A. Thompson, the Canadian Government decided to take steps to improve the situation. It particularly assisted in the establishment of co-operatives among the fishermen. They were helped to build their own canneries and wholesale co-operatives. The movement proved to be an economic success and was developed. This included forming a long chain of consumers' co-operatives.

Detailed economic problems of an isolated fishing community and the various steps which may be taken to improve it are shown.

M. J.

OUT WITH THE FISHERMEN. Producer: G. B. Instructional Ltd., Imperial Studios, Elstree Way, Boreham Wood, Herts, England. Distributor: G. B. Equipments Ltd., Mortimer Street, London, W. 1. For distribution outside the United Kingdom, special arrangements are made in each case. Technical data: 16 mm., black and white, and color; silent; 289 feet; 8 minutes running time; titles in English. Price: 16 mm. black and white, £11.0.0; 16 mm. color, £18.0.0d. Rental in the United Kingdom: 5s. 6d. first day.

This film was originally produced by an amateur but was later taken over by G. B. Instructional Ltd. It contains shots from a medium-sized fishing vessel sailing from the United Kingdom to the fishing grounds. Shows how ropes are spliced and nets made ready on the way to the grounds. The shooting and hauling of a Danish seine are shown. The boat then proceeds to a large fishing port where the fish boxes are unloaded. It then returns to its small home port where some brief shots of net making and mending are given.

The film is mainly intended for school use.

M. J.

THE DEVELOPMENT OF THE TROUT. Producer: G. B. Instructional Ltd., Imperial Studios, Elstree Way, Boreham Wood, Herts, England. Distributor: G. B. Equipments Ltd., Mortimer Street, London, W. 1. For distribution outside the United Kingdom, special arrangements are made in each case. Technical data: 16 mm., black and white, sound, 576 feet, 16 minutes running time, commentary and titles in English. Price: 16 mm. black and white, sound, £21.0.0d; silent, £16.10.0d. Rental in the United Kingdom: 15s. first day.

The film opens with pictures of trout eggs on the bottom of the stream, and sperm deposited over them. The sperm cells are seen under a microscope, as well as the development of the embryo in micro-cinematography. It is first seen as a dark streak in the egg, followed by shadows where the eyes appear. Then a heart is formed. One sees it beating and the blood corpuscles moving in the blood vessels in the egg yolk. When the embryo is further developed, it moves violently and at last leaves the egg. The yolk sac gets smaller and smaller and the various stages of development of the tail fin are shown. The fry are now feeding on crustaceans, etc. When it is further developed, it hides under stones and dark spots during the winter. Finally, the mature trout is seen spawning its eggs, guarded by the male trout, and the cycle is completed.

M. J.

CATCH OF THE SEASON. Producer: G. B. Instructional Ltd., Imperial Studios, Elstree Way, Boreham Wood, Herts, England. Distributor: G. B. Equipments Ltd., Mortimer Street, London, W. 1. For distribution outside the United Kingdom, special arrangements are made in each case. Technical data: 16 mm., black and white, sound, 1 reel, approximately 10 minutes running time, commentary and titles in English. Price: 16 mm. black and white, £10.0.0d. Rental in the United Kingdom: 7s. 6d. first day.

This is a popular version of the above-mentioned "Development of the Trout," mainly of interest to amateur fishermen.

M. J.

INTER-DEPENDENCE OF POND LIFE. Producer: G. B. Instructional Ltd., Imperial Studios, Elstree Way, Boreham Wood, Herts, England. Distributor: G. B. Equipments Ltd., Mortimer Street, London, W. 1. For distribution outside the United Kingdom, special arrangements are made in each case. Technical data: 16 mm., black and white, sound, 326 feet, 9 minutes running time, commentary and titles in English, Norwegian or Swedish. Price: 16 mm. black and white, £10.0.0d. Rental in the United Kingdom: 7s. 6d. first day.

Shows how the various plants and animals in a fish pond depend on each other. In micro-cinematography one sees how leaves from plants decay at the bottom of the pond, how they are attacked and

dissolved by bacteria, and how infusoria consume both parts of the dead leaves and the bacteria. These organisms are eaten up by larger creatures, such as water lice, mayflies, larvae, worms, fresh-water shrimps, etc. An example of an aquarium with water heavily polluted with organic particles is shown. Some water fleas are released into the water, which consume the particles. Soon the water is completely cleared. Later on, minnows, stickle fish and other small fishes consume the water fleas, etc. The refuse from the fishes sinks to the bottom and supports the growing water plants. The oxygen and carbon dioxide cycle is also shown. Oxygen is liberated from the plants in the form of small bubbles. The fishes use the oxygen and discard carbon dioxide, which is utilized by the plants.

The film is designed for school use but may be of value also in fisheries extension work, especially related to fish culture.

M. J.

Notes on Publications

FWS 9.6 FISHERIES ABSTRACTS UDC 01

Informationen über die Fischwirtschaft des Auslandes [Information about Fisheries Industries in Foreign Countries], No. 11, November 1951. Bundesministerium für Ernährung, Landwirtschaft und Forsten - Aussenstelle des Fischereireferates, Hamburg, Germany. 39 pp., mimeo. In German.

1951

Continues a monthly series, started in 1951, which contains translated excerpts from fisheries periodicals in other countries, mainly on commercial and technological topics.

FWS 9.2 FISHERIES STATISTICS—U.S.A. UDC 31:639.2(73)

Peterson, C. E. Preliminary Review of the Fisheries of the United States, 1951. *Fishery Leaflet 393*, rev. March 1952. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C., U.S.A., 15 pp., mimeo. In English.

1952

Contains preliminary estimates on the U.S. and Alaskan fisheries in 1951 with comparative data for earlier years. Also statistical tables on craft, gear, employment, catches, manufactured products, foreign trade and price indices. There are also estimates on the annual per caput consumption of fish (1948-51) and on the value of the industry and capital investments.

FWS 9.3 FISHERIES LAWS AND REGULATIONS – NORWAY UDC 34:639.2 (481)

Norway, Fiskeridirektøren. Norsk lovgiving om utøvelse av fiske [Norwegian Legislation on Conduct of Fishing]. *Fiskeridirektoratets Smaaskrifter, N. 10 - 1951.* A. S. John Griegs Boktrykkeri, Bergen, Norway. 13 pp. In Norwegian.

1951

A summary account of all legislation regulating fishing activities. Developed over centuries, these laws are spread out in the Norwegian

legislation. Here they are classified under (*a*) General, (*b*) Specific Fisheries, and (*c*) Policing and Inspection.

FWS 9.7 FISHERIES EDUCATION — PHILIPPINE REPUBLIC UDC 37 (914)

Philippine Republic, Department of Agriculture and Natural Resources, Bureau of Fisheries. Prospectus of the Philippine Institute of Fisheries Technology 1951-52. Manila, Philippines. 21 pp. In English.
1951

Gives the history, organization and location of the Institute, the facilities for instruction, regulations, etc. The curricula of the three 3-year courses in (1) Fish Capture, (2) Fish Preservation, (3) Fish Culture, are listed and some 40 lecture courses outlined. The first semester of the first year is common to all students who begin to specialize in one of the three courses during the second semester. The third year in all three courses consists of 6 months practical training in the respective field of study.

FWS 1.015 FISHES—W. PACIFIC OCEAN FISHES — INDIAN OCEAN UDC 597 (265:267)

De Beaufort, L. F. and Chapman, W. M. The Fishes of the Indo-Australian Archipelago, IX – Percomorphi (concluded), Blennoidea. E. J. Brill, Leiden, Netherlands. xi + 484 pp., 89 fig. In English. Price : Gld. 45.00.
1951

Classifies and describes the fishes of the groups considered, and gives distribution of the species. Four more volumes of this series are being prepared ; Volume 10 will deal with the fish of the group Gobioidea ; Volume 11 with Scleroparei, Discocephali, Xenopteri, Pediculati, and perhaps the Opisthomi ; the 12th will contain an account of the Plectognathi ; and the last volume, 13, will deal with rays and sharks.

FWS 1.1 TUNAS, MACKERELS, ETC. — U.S.A. UDC 597.5(73)

Fitch, John E. Age Composition of the Southern California Catch of Pacific Mackerel, 1939-40 Through 1950-51. *Fish Bulletin No. 83.* Department of Fish and Game, Bureau of Marine Fisheries, Sacramento, Calif. U.S.A. 73 pp., 17 fig., tables, appendices. In English.
1951

Gives results of age determinations of the commercial catch of Pacific Mackerel by the study of their otoliths. Growth studies are also included. Based on the study made, an outlook for the future of the Pacific Mackerel is presented.

FWS 1.1 TUNAS, MACKERELS, ETC. — PACIFIC ISLANDS UDC 597.5(96)

Godsil, H. C., and Greenhood, E. C. A Comparison of the Populations of Yellowfin Tuna, *Neothunnus Macropterus*, from the Eastern and Central Pacific. *Fish Bulletin No. 82.* Department of Fish and Game, Bureau of Marine Fisheries, Sacramento, Calif., U.S.A. 33 pp., 6 fig., tables. In English.
1951

A comparative study of morphometric measurements from specimens of the Hawaiian, Palmyra and Fijian Islands, and the Eastern Pacific coast of North America. A study of the homogeneity of the Central Pacific stocks is also included.

FWS 1 FISHERIES—BIBLIOGRAPHY UDC 639.2 (01)

Scattergood, Leslie W. (Compiler). English Translations of Fishery
1951 Literature. *Special Scientific Report: Fisheries, No. 35.* United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A., March 1951. 65 pp., mimeo. In English.

The third in a series of bibliographies of English translations of fisheries literature. The first two sections were issued by the Washington State Department of Fisheries, Smith Tower Building, Seattle, Wash., U.S.A. and copies are available on request to that agency. The following bibliographic information is given for each translation : author ; date ; title in original language ; name of journal or series or institution responsible for the publication ; volume, pages, place and date of printing ; name of translator and translator's address ; whether translation is complete or partial ; pages of translation ; where the translation can be obtained, and the cost, if any.

FWS 1.015 FISHERIES — CEYLON UDC 639.2 (548.7)

Ceylon Fisheries. Recommendations of Experts on Fisheries Devel-
1951 opment Research, Socio-Economic and Industrial Problems. *Sessional Paper. VI. 1951.* Government Publications Bureau, Colombo, Ceylon, April 1951. 170 pp.. In English Price : Rs. 3.85.

Contains : (1) Report on the Fisheries of Ceylon, by C. F. Hickling ; (2) Report to the Ministry of Industry, Industrial Research, and Fisheries, by H. Blegvad; (3) Report on the Handling, Treatment, Packing, Transport, Refrigeration, Storage and Sale of Fish, with Notes on Fisheries By-products, by E. Peterson, with 10 appendices on Norwegian regulations, ice plants and refrigeration, comments on tenders for ice plants, investigation of the fish consumption in Colombo, analysis of fresh fish, investigation of the possibilities of freezing and cold storing of Ceylon fish, experiments on salting and drying of Ceylon fish, experiments of the keeping qualities of fresh iced Ceylon fish, fish meal and oil and vitamin oils ; (4) Some Suggestions for Developing the Fisheries of Ceylon, by C. C. John ; (5) Report on Ceylon Fishing Industry, by G. L. Kesteven.

FWS 1.015 FISHERIES — CEYLON UDC 639.2 (548.7)

De Zylva, E.R.A. Administration Report of the Acting Director
1951 of Fisheries for the Years 1940 to 1950. Part I-1940 to 1947. Government Publications Bureau, Colombo, Ceylon. 20 pp. In English. Price : 40 Ceylon cents.

Gives a short account of the various functions performed by the fisheries administration, including the fisheries inspectors and the Fisheries Advisory Board. Special paragraphs deal with various welfare schemes such as assistance to co-operative societies and with technical experiments and surveys conducted by the Government.

FWS 1.015 FISHERIES — FEDERATION OF MALAYA AND SINGAPORE UDC 639.2 (595.13)

Burdon, T. W. Annual Report of the Fisheries Department,
1951 Singapore, 1950. Government Publications Bureau, General Post Office, Fullerton Building, Singapore. 67 pp., 12 fig., tables. In English. Price : Straits $ 1.00.

Eleven chapters dealing with matters of local fisheries administration and certain economic features such as availability of fresh fish in

the Colony, marketing, prices, transport, and trade. Contains many statistical tables and special summary tables giving an inventory of the fishing industry.

FWS 1.0113 FISHERIES — U.S.A. UDC 639.2 (73)

Washington State Department of Fisheries. Annual Report, 1950.
1951 Seattle, Wash., U.S.A. 143 pp., illus. In English.

Covers the work of the Department in stream rehabilitation, fisheries research, shellfish management, hatcheries, co-operative programs, construction, fisheries patrol and commercial statistics.

FWS 2.1121 FISHING METHODS AND GEAR — DRAG NETS UDC 639.2.081.112

Bullis, Harvey R. Gulf of Mexico Shrimp Trawl Designs. *Fishery*
1951 *Leaflet 394.* United States Department of the Interior, Fish and Wildlife Service, Washington 25, D. C., U.S.A., September 1951. 16 pp., illus. In English.

Gives construction details for three principal designs of nets which have been used successfully by the exploratory fishing vessel *Oregon* for shrimp fishing and are now in use in the Gulf of Mexico.

Described is a 40ft. (12.2 m.) No-Overhang Flat Trawl, a 100ft. (30.5 m.) Overhang Flat Trawl, a 74ft. (22.5 m.) Four-Seam Balloon Trawl, and trawl doors. Sizes, materials, construction and the cutting of net parts, etc., are shown in drawings and photographs.

FWS 1.95 WHALING UDC 639.245.1

International Commission on Whaling. Second Report of the Com-
1951 mission. Office of the Commission, London.1 6 pp. In English.

Official account of membership and discussions during the second fiscal year, 1 June 1950 to 31 May 1951, mainly at the second meeting of the Commission held at Oslo, Norway, 17 July 1950.

FWS 9.16 FISH CULTURE UDC 639.3

Huet, Marcel. Traité de pisciculture [Fish Culture Treatise]. Edi-
1952 tions la vie rustique, avenue Georges Henri 299, Brussels, Belgium. xiv + 369 pp., 280 fig., appendix. In French. Price B. Fr. 210.

Gives the principles of the culture of various types of fish, including cyprinoids, salmon group, pike, caregonoids, bass, tilapia and eels. Also contains information on the productivity, stocking, construction, maintenance, improvement and emptying of ponds, and feeding of fish.

FWS 2.11 NAVIGATION AIDS UDC 656.61

Hugon, P. Le radar de navigation [Radar for Navigation]. Société
1951 d'éditions géographiques, maritimes et coloniales, rue Jacob 17, Paris 6. 234 pp., illus. In French. Price : F.Fr. 1,200.

Gives the essentials of radar for marine use, the possibilities and performance of radar, methods of use, current tendencies in its development and possibilities for its use, as well as the general principles of radar, and technical details about the equipment and its operation.

FWS 3.3 CANNING—FISH—FRANCE UDC 664.951.6 (44)

1951 Livre d'or de la conserve française de poissons [The Golden Book of French Fish Canning]. Union des syndicats français des fabricants de conserves de poisson, Impasse de la Rosière d'Artois 1, Nantes, France. 110 pp., illus. In French.

Prepared by officials of the French government fisheries administration and canners union and published for the second International Canning Congress held in Paris in October 1951.

Gives a general picture of the fish canning industry in France from its origin to date. Covers the different kinds of fish utilized in France for canning, the question of cans and oil, the technological problems, and the sanitary control of the products.

Reviews the main characteristics and development of the fishing ports supplying the raw material to canning plants. Other articles describe the set-up and activities of the French union of canners. A series of cooking recipes is also given. Includes many photographs.